



Permit No.
45-01

Henderson County, North Carolina

Report

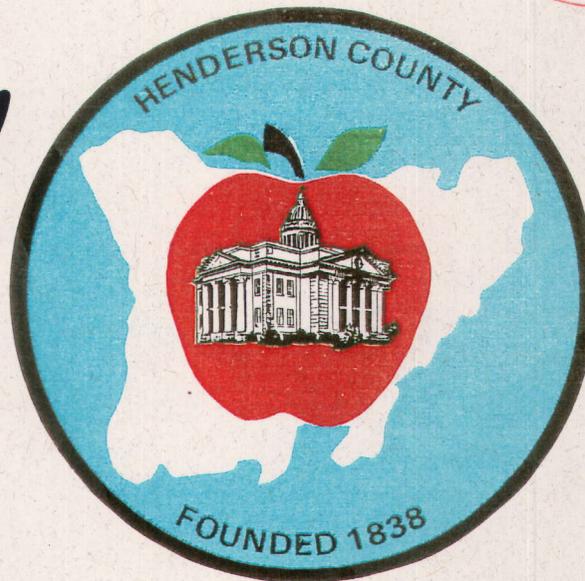
Application for Construction and
Demolition Debris Disposal Facility
on Top of Closed Henderson County
MSW Landfill

Fac/Permit/Co ID # 45-01	Carmen Johnson	
	Date 7/23/13	Doc ID# DIN

June 1998



File Copy



APPROVED
DIVISION OF SOLID WASTE MANAGEMENT
DATE 9/17/98 BY TAD

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Section 1

Construction and Demolition Waste Design and Operations Plan

1.1 Introduction

The intent of this application is to obtain a permit for a construction and demolition (C&D) debris disposal area on top of the closed portion of the Henderson County, North Carolina municipal solid waste (MSW) sanitary landfill. This application relates to the 1.9± acre top portion of the existing landfill.

The Henderson County Sanitary Landfill is located off Stoney Mountain Road in Hendersonville, North Carolina. The unlined landfill consists of a 60-acre footprint with generally 3:1 horizontal to vertical sideslopes. Operations began at the landfill in 1960 and on-site disposal of MSW ceased as of December 31, 1997. The site operated strictly as a municipal solid waste facility with an estimated capacity of 1,200,000 tons. The site also included a recycling center and a tub grinder to aid in the disposal of yard and wood waste. Henderson County now operates a transfer station to handle the County's municipal solid waste and construction and demolition debris waste. Transfer operations began as of January 2, 1998.

According to Henderson County estimates, approximately 11-acres of the site is classified as Category 3 landfill. The top 1.9± acre portion covered by this application has been closed in accordance with Rule 15A NCAC 13B .1627(c)(2) and in general accordance with the Revised Henderson County Transition Plan dated September, 1996.

This permit application includes the following major items:

- Construction and Demolition Waste Design
- Operations Plan
- Closure Plan
- Post Closure Plan
- Groundwater Monitoring Plan
- Closure Certification and CQA Report for MSW Landfill

Since this permit application is for C&D disposal over an existing, closed landfill area, many of the existing landfill engineering features and operational plans will be used for the C&D operation. Relevant sections from the Revised Henderson County Landfill Transition Plan have been incorporated.

1.2 Earthwork Calculations

Airspace

The Earthworks Module of Softdesk software was used to estimate the total airspace between the C&D base (MSW landfill final contours) grades and the top of the proposed C&D final cover grades. The total computed airspace is 14,000 cubic yards (CY).

1.2.1 Final Cover Soil Required

The C&D landfill will be covered with the Subtitle D regulatory cap system in accordance with Rule .1627(c). The final cover material volume required to construct the 2-foot thick cover system (18" barrier layer and 6" vegetative layer) for the C&D landfill (approximate 1.9 acre total surface area) is 6,130 CY. The revised Closure Plan for the facility is in Section 1.5.

1.2.2 Daily and Intermediate Cover Soil Required

It is anticipated that a 4:1 waste to cover ratio will be achieved at the C&D landfill. Deducting for final cover volume, approximately 7,870 CY of airspace will be available for C&D disposal and daily/intermediate cover. At a 20% cover to waste ratio, 1,574 CY daily and intermediate cover will be required.

1.2.3 Available Net Airspace for C&D Disposal

14,000 CY (total airspace) - 6,130 CY (final cover volume) - 1,574 CY (cover material) = 6,296 CY net airspace for disposal of C&D debris.

1.2.4 C&D Landfill Operating Life

Available airspace for C&D debris = 6,296 CY.

Converting to weight (assuming 1,200 lb/CY density for C&D debris):
 $6,296 \text{ CY} \times 1,200 \text{ lb/CY} \times 1 \text{ ton} / 2000 \text{ lb} = 3,778 \text{ tons of C\&D debris.}$

Henderson County has estimated that the annual disposal rate of C&D waste will be 7,000 tons per year.

CDM assumes that this is a representative average annual disposal rate for C&D debris. However, the actual operational life of the disposal area may be somewhat more or less depending on actual tonnage received.

Operating life of C&D disposal unit = 6 ± months

1.2.5 Net Balance of On-site Soils

The net on-site soil requirements will be the soil needed for daily, intermediate, and final cover:

1,574 CY daily and intermediate cover required

plus 6,130 CY final cover soil required

equals 7,704 CY of needed on-site soil. The existing site has more than adequate soil resources remaining to satisfy the soil needs of the C&D landfill.

1.3 Operation Plan

Rule .1617(d) requires that the Transition Plan include an Operations Plan prepared in accordance with Rule .1625, Operation Plan for MSWLF Facilities, and Rule .1626 Operational Requirements for MSWLF Facilities. The C&D waste disposal activities will maintain the Operation Plan requirements specified in Section 1 of the Transition Plan with modifications presented below which are specific to the operation of a C&D disposal site. The Transition Plan Operations Plan is in Appendix A of this application.

The operator of the Henderson County C&D disposal facility will begin filling operations at the southwest end of the proposed 1.9 acre area. Construction and demolition debris will be brought to the fill area via the existing landfill access road and deposited on the working face. There the waste will be compacted by a steel-wheeled compactor making a minimum of four passes. The existing scale house and scales will be utilized to monitor the quantity and content of C&D waste hauling vehicles.

1.3.1 Solid Waste Working Area and Compaction

In accordance with 15A NCAC 13B .0505 (2)(a), the County shall restrict C&D waste within the C&D landfill to the smallest area feasible. The working face is defined as where C&D waste is unloaded, inspected, spread, compacted, and ultimately covered with cover material. The working face shall be wide enough to prevent a backlog of vehicles waiting to unload and to allow adequate working space for landfill equipment. At a maximum, the width of the working face shall not exceed 100 feet.

In accordance with 15A NCAC 13B .0505 (2)(b), C&D waste shall be compacted as densely as practical into cells. After C&D waste is discharged from vehicles, it shall be inspected for unacceptable items and subsequently spread on the working face not steeper than four feet horizontal to one foot vertical in layers not to exceed 2 feet in thickness. All areas of each layer shall be compacted by at least four passes of a compactor in order to achieve a minimum waste density of approximately 1200 lbs. per cubic yard.

1.3.2 Cover Material

In general accordance with 15A NCAC 13B .0505 (3)(a), the County shall place at least six inches of operational soil cover over the C&D waste a minimum of once per week or when the active area reaches one-half acre in size or more often as

In accordance with 15A NCAC .0505(5)(a)(b)&(c), surface water shall be diverted away from the operational area and surface water shall not be impounded over or in waste. All completed areas shall be adequately sloped to allow surface water runoff in a controlled manner.

In accordance with 15A NCAC .0505(7)(a)&(b), a separation distance of four feet between waste and water table shall be maintained, and solid waste shall not be disposed of in water.

1.3.5 Explosive Gas Control Plan

Henderson County instituted a new landfill gas monitoring plan in 1993. Details of the approved plan are in Section 1, Operation Plan, of the approved Transition Plan, which is in Appendix A of this application.

1.3.6 Maintenance of MSW Closure Cap System and Vegetation Requirements

The closure cap on the 1.9 acre MSW area proposed for C&D disposal was constructed of an 18-inch barrier layer and a 6-inch vegetative layer. Until the entire 1.9 acre area is covered with C&D waste, the County will maintain the existing cap system to insure its intended functionality. Any area that will not receive waste within 30 days will be seeded to minimize erosion. Any eroded areas will be repaired immediately.

In accordance with 15A NCAC .0505(6)(a)&(b), the area shall be stabilized with native grasses within six months after final termination of disposal operations at the site or a major part thereof or upon revocation of the permit. Temporary vegetation will be applied as needed for stabilization.

1.3.7 Security and Safety Requirements

The existing entrance facilities, scales and haul road will be used for the C&D facility. All existing security measures and signs will be maintained.

In accordance with 15A NCAC .0505(8)(b), an attendant shall be on duty at the site at all times while it is open for public use to ensure compliance with the operational requirements.

1.3.8 Waste Acceptance and Disposal requirements

Section 1, Operation Plan, of the approved Transition Plan for the Henderson County landfill (see Appendix A) describes waste acceptance procedures and guidelines for the MSW landfill. The County will continue to utilize the same entrance and scale operation with personnel to monitor incoming loads to the

C&D facility. The County will continue to conduct the required screenings and MSW will not be allowed in the C&D facility.

1.4 Water Quality Monitoring Plan

The approved Water Quality Monitoring Plan, Section 4 of the Transition Plan, is in Appendix D of this application. The placement of construction and demolition waste on top of the existing landfill footprint will not require alteration of the current groundwater monitoring program or require the installation of additional monitoring wells.

1.5 Closure Plan

Upon completion of C&D disposal activities, the closure plan described in Section 2 of the Transition Plan will be followed. The Transition Plan Closure Plan is presented in Appendix B of this application. This closure plan establishes: design criteria for the closure cap system and the gas venting system, a closure sequence and construction schedule, construction costs, and other important information relating to closure.

1.5.1 Closure Cap System

The closure cap system for the C&D landfill will be identical to the cap system specified in the Transition Plan Closure Plan (see Appendix B). The closure cap system will consist of an erosion layer capable of sustaining vegetative growth and low permeability barrier layer. The closure cap system will consist of the following layers (listed from top to bottom):

- A six-inch Erosion Layer consisting of soil capable of supporting native plant growth;
- An 18-inch Low Permeability Barrier Layer of compacted soil material to minimize infiltration of stormwater. This layer will have a specified permeability of no greater than 1×10^{-5} cm/sec; and,

The eighteen inches of compacted material shall be installed in six (6) inch lifts, and compacted to a predetermined density to ensure that the specified permeability is being obtained. In-place density tests will be conducted during each lift placement to verify compaction requirements. The closure cap system will accommodate the differential settlement anticipated to occur during the post-closure period. The post-settlement grades of the top surface slopes will not be less than 5 percent (to prevent ponding) and the side slopes will not exceed 25 percent (to limit erosion).

1.5.2 Quality Control and Assurance

A Construction Quality Assurance (CQA) report will be submitted after construction completion of the C&D area cap system in accordance with Rule

.1629. The CQA report will be prepared according to the requirements of Rule .1621. The CQA report will be sealed by a professional engineer to certify that construction was completed in accordance with the approved closure plan.

1.5.3 Landfill Closure Sequence

The development of the C&D landfill on the landfill top of the closed portion of the MSW landfill, will be conducted so that, at any time, the current operating phase can be closed with the appropriate drainage requirements. The steps for implementing the closure process are described in the Transition Plan Closure Plan (see Appendix B).

1.6 Post Closure Plan

Henderson County will begin to implement the Post Closure Plan approved in the Transition Plan on July 1, 1998, for the closed out portions of the MSW disposal areas. The County will follow the same plan for the closed out C&D disposal areas when C&D disposal operations cease. The approved Post Closure Plan is in Appendix C of this application.

1.7 Closure Certification Report for MSW Landfill

The closure certification report for the 1.9 acre MSW disposal area is in Appendix E.

Appendix A
Operation Plan

SECTION 1 OPERATION PLAN

Section 1.1 Description of Existing Operation

The existing Henderson County Landfill is located in the North Central part of Henderson County on Stoney Mountain Road. The County has approximately 120 acres at this site with approximately 60 acres being utilized for the landfill. The remaining property is serving as buffer, borrow soils area, animal shelter, and maintenance buildings. Enclosed with this Transition Report is a set of plans which cover the existing and planned phases of the landfill operation. Drawing sheet No. 1 depicts the 1993 site plan of the current landfill operation with contours as of the fall 1993. Henderson County has made it a practice to have aerial topography mapping conducted of the landfill each Fall for the past several years. This has allowed the County to track the rate of fill by comparison of contour maps from one year to the next. Drawing sheet No. 1 depicts the existing contour levels as of the Fall of 1993. This drawing also identifies location of the various aspects of the landfill operation.

The current active landfill area is being operated as an open face landfill utilizing on site soils for berm construction. Approximately 200 to 300 tons per day of solid waste is being disposed in the active portion of the site. The working face size varies on a daily basis, and is approximately 10,000 square feet (1/4 acre). The County also

holds a permit, obtained in 1991, for a demolition disposal area. This demolition area is not being heavily utilized due to unavailable County personnel to police the demolition disposal area sufficient to prevent unauthorized material from being deposited in the demolition area. Currently the site is being operated with all waste other than recyclable materials, white goods, prohibited materials, and yard waste being disposed of in the solid waste landfill. The site contains a recycling center and the County is providing a very aggressive recycling program including the development of a materials recovery facility. The County purchased a tub grinder which is aiding in the disposal of yard and wood waste. The use of the tub grinder has resulted in a significant reduction of solid waste being disposed of in the landfill. Mulch generated by the tub grinder is being sold by the County.

In the Spring of 1993, a site utilization study was conducted of the existing landfill operation. Several recommended changes to the operation were made including the use of an alternate daily cover versus on site soils and the return to the 1982 permitted contours utilizing air space above the recycling center and haul road. In 1986 a change was made to the landfill operation locating the haul road and recycling center within the base of the landfill operation. This resulted in a loss of air space based on the 1982 approved contour levels. The County is currently returning to these 1982 contours utilizing the air space above the

recycling center and haul road. Also a polyvinyl tarp type alternate daily cover is being used to reduce space lost due to soil daily cover.

The daily operational routine consists of building berms with on site soils, receiving waste into the berm area, compacting solid waste with a mechanical compactor, and providing daily cover with tarp. Occasional soil daily cover is used during wet periods or extended periods where landfill is closed. The current permitted top elevation of the landfill is at elevation 2410 and the current fill elevation is at approximately of 2350. There is approximately a 10 acre area on top of the current fill and a 10 acre area on the west slope of the fill which is scheduled to receive additional solid waste. Filling of these two areas is expected to take until late 1997 at which time the permitted contours with top elevation of 2410 will have been obtained and the landfill closed and capped. The County was pursuing the development of a new landfill site but has chosen to look at trucking the solid waste outside of Henderson County in the future. It is expected to have in place within the next year a contract for handling the County's solid waste once the landfill is closed. The set of plans attached with this report has been prepared to serve as the operational drawings and additional required drawings for the Transition Plan in accordance with T15A: 13B.1600.

The County is in the process of developing a landfill gas

collection and disposal system. The County contracted with Cargan Resources to conduct a Phase I Landfill Gas Remediation Plan. This Phase I Plan was completed and the County is entering into Phase II which will lead to the operation of a landfill gas collection and disposal system. Drawing No. 9 depicts the landfill gas collection and disposal system which is currently under construction. A temporary flare station and collection well system was installed during early 1995 to remediate the off site gas migration situation at the top of the landfill. This system has been in operation since May 1995 and has successfully stopped the off site migration.

Section 1.2 Operation Report

The Transition Plan has been developed with a set of drawings to cover the existing and planned continued operation of the Stoney Mountain Road Landfill. The drawings have been developed to show the existing site and phase of operation as of the Fall 1993 (Sheet No. 1). Sheet No. 2 is the expected phase of the operation with fill contours by the end of 1994. Sheet No. 3 is the expected phase of the operation with fill contours by the end of 1995. Sheet No. 4 is the expected phase of the operation with fill contours by the end of 1996. Sheet No. 5 is the expected phase of the operation with the final contours to be established by the end of 1997. Sheet No. 6 is the closure plan which depicts those areas requiring the required cap system under Rule .1627. Drawing No. 7 is

the Local Characterization Study required as part of the Closure Plan showing the area around the landfill to at least 2,000 feet from the current property boundary. Drawing No. 8 is the Water Quality Monitoring Plan showing existing and proposed ground water monitoring wells and surface water quality monitoring locations. Drawing No. 9 depicts the landfill gas collection and disposal system. Drawings No. 10, 11, and 12 are details of landfill cross sections, erosion control, and cap system.

The Henderson County landfill is operated in accordance with Rule .1626 which defines operational requirements. The County accepts only wastes for which it is permitted and prohibits hazardous waste, polychlorinated biphenyls (PCB), and liquid waste. Spoiled foods, animal carcasses, abattoir waste, hatchery waste, and other animal waste when received is covered immediately. A separate area has been maintained for asbestos disposal (see sheet 1). This area is inactive since the County has not received any asbestos waste for some time. Wastewater treatment plant sludges are not accepted at the landfill. The County provides an entrance gate at the scale operation with personnel to monitor incoming loads. Waste is placed within the base area of the current permit and provided with daily cover of either 6 inches of soil or alternate polyvinyl tarp. A request for approval of the alternative polyvinyl tarp was requested of the Division by letter dated April 26, 1993 to use an alternative polyvinyl (Fabrisol) tarp

cover. The Division did not respond to this request and the County advised by letter dated October 6, 1993 that they were beginning the use of the tarp cover. This has been in practice for the past two years and has operated successfully. The County is pursuing the installation of landfill gas collection and disposal equipment necessary for compliance with landfill gas requirements. A perimeter monitoring gas well system is in place and shown on drawing No. 9. The site is fenced with access control through a main gate and scale operation.

No open burning of solid waste is allowed at the landfill. Access and haul roads are being maintained to minimize erosion and dust pollution. A series of sediment basins are utilized on site to provide erosion control. All drainage from the disturbed areas is routed through one or more sediment basins and the sediment basins are periodically cleaned by dredging collected sediments. Seeding of disturbed areas is provided where necessary to control site erosion. All sedimentation and erosion control measures have been previously approved by the Division of Land Resources.

The County does not allow the disposal of liquids at the landfill, and waste oil collection is provided at the recycling center. The current landfill is not lined and does not have a leachate collection system. Based on results of surface water and ground water monitoring, there is little evidence of any leachate contamination from this facility.

The proposed landfill gas collection and disposal system will generate some condensate, estimated at a few hundred gallons per month. It is planned to dispose of the condensate by either atomizing the liquid into the gas disposal flare or connection to area sanitary sewer system.

The landfill operators are maintaining operational records including scale information, inspection records, gas monitoring results, water quality monitoring results, and operational engineering drawings. The office at the landfill is equipped with computerized word processing and staffing such that day to day operations and correspondences can be handled by landfill staff.

Section 1.3 Facility Programs

The Henderson County Stoney Mountain Road Landfill has in place facility programs for detecting and preventing the disposal of hazardous and liquid wastes. The County has three certified Solid Waste Enforcement Officers which have received training and certification by the Solid Waste Association of North America. The State of North Carolina currently does not have a certification program; however, the above certification is recognized by the N.C. Division of Solid Waste Management. The County currently performs random inspections of incoming loads at a frequency of one day per month which exceeds the requirement of inspecting at least 1% of the waste processed

at the landfill. Loads are inspected by having hauler unload in an area separate from the active working face and County personnel visually inspect the load for hazardous and liquid wastes. Inspection forms are completed following each load inspection and kept on file.

In addition to the Solid Waste Association of North America certification program, County Solid Waste personnel are allowed to attend various training seminars as they are available. The use of the SWANA certification and local seminars has been adequate in training County staff to recognize and manage any hazardous and liquid wastes.

In the event the landfill receives any hazardous or liquid wastes the County has a contingency plan to properly manage these wastes. If the generator of the hazardous or liquid wastes can be identified, they are contacted to remove these wastes from the landfill for proper disposal. Where identification of generator can not be made, identified hazardous and liquid wastes are collected, stored in weather proof containers, and arrangements made to ship wastes to proper disposal facilities.

Henderson County is currently using an alternative daily cover, consisting of a polyvinyl tarp type material. By not using the six inches of soil for daily cover the County is saving approximately 185 cy of space per day. This is extending the life of the current site, and use of the alternative cover is working very well.

Henderson County is also involved in landfill gas management. During 1993 a Phase I Landfill Gas Remediation Study was undertaken by contract to Cargan Resources, Inc. This Company specializes in landfill gas management. A series of gas monitoring wells were installed at the perimeter of the landfill and monitored for various landfill gas parameters. With this data, a landfill gas collection and monitoring system was designed and is currently under construction. Disposal of the gas is by flaring, and it is planned to study possible use of the gas as alternative fuels. Drawing No. 9 depicts the landfill gas collection, flaring, and monitoring system. Monitoring of the landfill gas perimeter wells is continuing with weekly testing. Data collected from these gas wells is kept on file at the facility. These wells are be monitored for the following:

- % LEL Lower Explosive Limit
- % CH4 Methane
- % O2 Oxygen
- % CO2 Carbon Dioxide
- % Balance Gases
- Barometric Pressure

All on site buildings are monitored to insure that the methane levels do not exceed 25% of the LEL and perimeter gas monitoring wells are check to insure no off site migration. Currently all structures and wells are sampled weekly with

sampling results being kept on file at the landfill office.

Should methane levels be detected in the structures or migrating off site then the County will immediately notify the Division and take steps necessary to protect human health. Within 7 days the County will place in the operating recorded the methane levels detected and the steps applied to insure human health, and within 60 days of detection, implement a methane gas remediation program.

Should the weekly monitoring not detect any areas of concern, then frequency could be reduced to once per month.

By use of soil and tarp daily cover operations the site is not experience any problems with disease vector control. Liquid wastes are not allowed for disposal in the landfill. The Paint Filter Liquids Test (SW 846) will be use should the County encounter liquid wastes. Currently the County is not having any problems with liquid waste disposal. The County utilizes a mechanical compactor on a small working face area. The working face is kept to approximately 1/4 acre to maximize compaction and utilization of space. All windblown material is collected and returned to the active fill area at the end of each day.

Section 1.4 Sedimentation and Erosion Control

The existing site sedimentation and erosion control is handled through a series of sedimentation basins along the streams and drainage ways of the site. Drawing No. 1 shows the site plan as of the Fall of 1993 with location of the

existing sedimentation basins. The sedimentation basins are periodically cleaned of accumulated sediments. Disturbed areas and landfill slopes are being seeded following active work. This seeding and use of the sedimentation basins are providing effective erosion control for the site. An additional sedimentation basin was approved by the Division of Land Resources and constructed on the South side of the landfill. Once the landfill is closed and stabilized, a determination will be made as to which sedimentation basins will remain in use.

Section 1.5 Remaining Site Capacity

During 1993 Henderson County had a Site Utilization Study conducted of the Stoney Mountain Road Landfill. This study estimated that the site had the potential to remain open until early 1998, with certain operational modifications to the site. The current landfill Rules requires sites to be closed by January 1, 1998 and it is felt that with good operational controls at the site the Stoney Mountain Road Landfill can remain open until late 1997.

During the Fall of 1993, an aerial photograph was taken of the landfill to produce a current topographic map of the site. The County has made it a practice to prepare aerial topo maps each year for the past few years. From 1991 to 1992 the site change in topography of the site indicated that the site volume of fill to be in the order of 400,000 cubic yards. This includes solid waste and soils used for berm construction

and daily cover. Waste compaction was low, estimated at 585 lb/cy. With use of an alternate daily cover and increased compaction to 900 lb/cy, it was estimated that annual fill rate could be reduced to 250,000 to 300,000 cubic yards.

The 1993 aerial topography map when compared to the 1992 aerial topography map indicates that the annual fill rate for 1992 to 1993 was approximately 150,000 cubic yards. This reduction has been achieved by increasing compaction to approximately 1,000 lbs/cy, use of the tub grinder to handle wood waste, and a reduction of wasteflow from 300 tons per day to 200 tons per day. At this rate of fill, it is estimated that the site will have a remaining site capacity of approximately 4 to 5 years until 1998.

Section 1.6 Areas which stopped receiving waste prior to 10-9-91.

Drawing No. 6 of the enclosed set of plans depicts the areas which stopped receiving waste prior to October 9, 1991. Since the Stoney Mountain Road Landfill is one large mountain type fill with common base, the cap will be common to all areas. It is planned to bring the fill at a 3 to 1 side slope to a cap area of approximately one acre. This one acre area will be required to meet certain closure and cap requirements.

State of North Carolina
Department of Environment,
Health and Natural Resources
Asheville Regional Office

James B. Hunt, Jr., Governor
Jonathan B. Howes, Secretary
Nann B. Guthrie, Regional Manager



LETTER OF APPROVAL
August 9, 1994



Mr. David Thompson
Henderson Co. Manager
100 N. King Street
Hendersonville, NC 28739

Dear Mr. Thompson:

This office has reviewed the erosion and sedimentation control plan submitted for the project listed below. We find the plan to be acceptable and hereby issue this Letter of Approval with modifications and/or performance reservations. A list of the modifications required and/or reservations is attached. This approval is conditioned upon the incorporation or addition of these items to the plan. Please be advised that Title 15A, North Carolina Administrative Code 4B.0017(a), requires that a copy of the approved soil erosion control plan be on file at the job site. Also, you should consider this letter to give the Notice required by NCGS §113A-61(d) of our right of periodic inspection to ensure compliance with the approved plan.

The State's Sedimentation Pollution Control Program is a performance-oriented program requiring protection of the natural resources and adjoining properties. If, following commencement of this project, it is determined that the plan is inadequate to meet the requirements of NCGS §113A-51 to 66, this office may require revisions to the plan and implementation of the revisions to ensure compliance with the Act.

Please note that this approval is based in part on the accuracy of the information provided in the Financial Responsibility Form which you have provided. You are requested to file an amended form if there is any change in the information included on the form. In addition, it would be helpful if you notify this office of the proposed starting date for this project. Your cooperation is appreciated.

Sincerely,

DGO
for Dennis G. Owenby
Asst. Regional Engineer

DGO:
cc: Mr. Gary Tweed
Project name: Stoney Mtn. Road Landfill
Location: Henderson County
Date received: 7/28/94
New submittal (✓) Revision ()

CERTIFICATE OF PLAN APPROVAL



The posting of this certificate certifies that an erosion and sedimentation control plan has been approved for this project by the North Carolina Department of Environment, Health, and Natural Resources in accordance with North Carolina General Statute 113A - 57 (4) and 113A - 54 (d) (4) and North Carolina Administrative Code, Title 15A, Chapter 4B.0007 (c). This certificate must be posted at the primary entrance of the job site before construction begins and until establishment of permanent groundcover as required by North Carolina Administrative Code, Title 15A, Chapter 4B.0027(b).

Stoney Mtn. Rd. Landfill - Henderson Co.

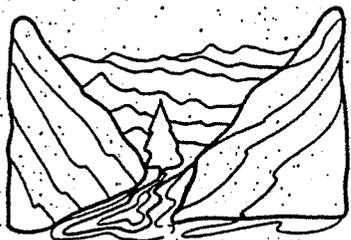
Project Name and Location

8/9/94

Date of Plan Approval

RA PLOU

Regional Engineer



William G. Lapsley & Associates, P.A.
Engineering, Surveying and Land Planning

1635 Asheville Highway
Post Office Box 546
Hendersonville, North Carolina 28793
704-697-7334 • FAX 704-697-7333

April 26, 1993

Hendersonville:
William G. Lapsley, P.E.
Gary Tweed, P.E.
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Sylva
Donald L. Hunley, P.E.

Ms. Sheri Hoytt
N.C. Division of Solid Waste Management
P.O. Box 27687
Raleigh, N.C. 27611-7687

Ref: Henderson County Solid Waste Programs

Dear Ms. Hoytt:

In follow up to our meeting of April 23, 1993, I would like to summarize those areas that we discussed with respect to the Henderson County Solid Waste Programs. Our meeting was very informative and the information gathered will be helpful to our firm assisting Henderson County with their solid waste programs. The two areas which we discussed were the selection of a new solid waste landfill and the utilization of the existing landfill site on Stoney Mountain Road.

NEW SITE SELECTION PROCESS

William G. Lapsley and Associates, P.A., has completed a site selection study for a new landfill site. The entire County was reviewed and siting criteria applied resulting in five of the top sites being presented to the Henderson County Commissioners in a final report. The County has taken this information and will soon be contacting property owners on at least two of the top sites for permission to conduct further on-site evaluations. It is anticipated that we will be ready for the State Task Force to look at these sites in early July, 1993. It is requested that time be scheduled for a visit by the Task Force to Henderson County in early July. By that time we feel that information will be available on the proposed sites such that the Task Force can make recommendations concerning the suitability of these sites for the new solid waste disposal facility.

SITE UTILIZATION STUDY

I left with you a copy of a recent site utilization study of the existing Stoney Mountain Road Landfill. Under the current permit and mode of operation, we have estimated that the landfill will be near its permitted capacity by early 1994. The site



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Ms. Sheri Hoytt
April 26, 1993
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utilization study was conducted to identify alternatives to extend the useful life of the existing site to gain the time necessary for the siting, permitting, construction and start up of a new landfill. There are several areas which we feel will improve the existing operation. Two (2) specific items, however, will require approval by your office. First, we have recommended that the County immediately begin using an alternative daily cover. The County was given permission some years ago to use a tarp type cover. This was attempted and used until the tarp became unusable. A new tarp was not purchased, and the practice discontinued. Several alternative covers have been evaluated, and it was recommended that the Fabrisol alternative cover be purchased and used instead of the daily soil cover. It is requested that the Division grant Henderson County approval to use an alternate daily cover as Fabrisol or its equivalent. The second recommendation which will require your Division approval is a proposed modification of the current permit to allow the relocation of the current recycling area which is on top of the existing landfill base and restructuring the landfill contours to the west face allowing for additional fill of approximately 400,000 cy. This will provide for approximately one additional year of operation. Borings conducted at the site verified the existence of waste at the recycling area at approximately 12 feet deep. By utilizing this air space, the top of the site can be extended to elevation 2410 approximately 20 feet above the current permit. As we discussed, the Division may wish to incorporate this change into a closure plan for the existing landfill and not as an application for vertical expansion. Please advise as to how the Division would prefer this request to be handled.

Other recommendations made to Henderson County concerned the scheduling of waste haulers, control of working face area, and other items to increase waste compaction. The County has purchased a tub grinder, and this operation is proceeding very well. All of the recommendations, if enacted, should give the County sufficient useful life of the existing site to allow time for opening of a new landfill. It is requested that these other proposed changes receive the Division's approval.

METHANE GAS INVESTIGATION

With respect to landfill methane gas compliance notice, we have presented two proposals to the County for the installation of gas monitoring wells and preparation of a phase I evaluation and report. The escaping methane gas appears to be very active along the entire northern side of the landfill from the animal shelter to

Ms. Sheri Hoytt
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the area near the top of the site. It is our recommendation that the County establish a gas collection system (most probably active systems) and disposal of the methane gas (flaring). Marketing of the methane gas will also be investigated.

GROUNDWATER MONITOR

With respect to ground water monitoring, we have discussed with Bobby Luftey the need for monitoring wells that are shallower and closer to the active landfill area. It is our intent to submit an updated monitoring plan with the closure plan.

It is requested that the Division approve of the use of the alternative daily cover and advise us how you wish to proceed with the permit modification to utilize the air space above the existing recycling area. Should there be any questions or if you need assistance, please contact our office at 704-697-7334.

Sincerely yours,



Gary T. Tweed, P.E.

cc: David Thompson
Jim Patterson
Bobby Luftey
Gary Ahlberg



ELDON OWEN
SOLID WASTE DIRECTOR
697-4505

NIPPY PAGE
INTEGRATED
SOLID WASTE PLANNER
697-4877

HENDERSON COUNTY
SOLID WASTE MANAGEMENT
802 Stoney Mountain Road
Hendersonville, NC 28739

October 6, 1993

Mr. Jim Coffey
N.C. Solid Waste Section
P.O. Box 27687
Raleigh, N.C. 27611

Ref: Stoney Mountain Road Landfill
Henderson County

Dear Mr. Coffey:

Mr. Jim Patterson with your staff has requested this letter to address the current status with the Henderson County Stoney Mountain Road Landfill. It is our intention to continue operating this landfill past October 9, 1993 in accordance with applicable State, Federal, and County rules and regulations. We have requested our consultant William G. Lapsley and Associates, P.A. to develop a proposal for the preparation of the Transition Plan. It is our understanding the Transition Plan is due by April 9, 1994. At this time a specific closure date for the landfill has not been established. Henderson County is in the process of siting a new landfill and we do plan to close the Stoney Mountain Road Landfill on or before the required January 1, 1998 closure date. At this time with the current solid waste load and operating conditions we should be able to remain in the current site until at least mid to late 1996. As you are aware conditions in the solid waste industry are constantly changing and the 1996 expected closure date could be extended. We intend to try and pin point a more exact closure date with the development of the Transition Plan.

We hope this information is sufficient as requested by Mr. Patterson. It should be noted that your staff has not responded to our request to utilize an alternative daily cover and return to the 1982 approved fill contours allowing filling of the air space above our recycling center. It is our intention to proceed with this plan of action unless directed otherwise. Should there be any questions do not hesitate to contact our office at 704-697-4505.

Sincerely yours,

Eldon T. Owens

cc David Thompson
Gary Tweed

Appendix B
Closure Plan

SECTION 2 CLOSURE PLAN

Section 2.1 Steps Necessary to close MSWLF

It is anticipated that the Henderson County Stoney Mountain Road Landfill will continue to operate into 1997 and stop receiving waste toward the end of 1997 prior to the January 1, 1998, required closure date. All MSWLF, operating past October 9, 1993, must meet subtitle D closure requirements. The Henderson County Stoney Mountain Road Landfill does not have a bottom liner thus requiring the cap infiltration layer to have a permeability of no greater than 1×10^{-5} cm/sec. Due to the time frame between now and 1997, it is anticipated that there will be changes in technology and regulations with respect to closure of MSWLF. This closure plan has been developed on the best information available at this time. Modifications to the plan are expected as technology improves over the next few years. At this time the following steps utilizing a Site Closure Check List are to be considered for closure of the Henderson County Stoney Mountain Road Landfill:

SITE CLOSURE CHECKLIST

PRE-PLANNING

- Identify final site topographic plan
- Prepare site drainage plan
- Specify source of cover material
- Prepare vegetative cover and landscaping plan
- Identify closing sequence for on site structures
- Prepare engineering procedures for on site structures

THREE MONTHS BEFORE CLOSURE

- Review closure plan for completeness
- Schedule closing date
- Prepare final time-table for closure procedures
- Notify N.C. Division of Solid Waste
- Notify site users of planned closing by public notice

AT CLOSURE

- Erect fences or structures to control access
- Post signs indicating site closure and alternative sites
- Collect any litter or debris for final cell
- Place cover over any exposed waste

THREE MONTHS AFTER CLOSURE

- Complete site drainage control features
- Complete gas & groundwater collection and monitoring systems
- Begin construction of required cap system
- Establish vegetative cover

COMPLETE CLOSURE WITHIN 180 DAYS AND RECORD NOTATION ON DEED

The above Site Closure Checklist will be used for the Stoney Mountain Road Landfill at any time between now and 1997 should the site be closed due to start up of the new Henderson County Landfill or in the event that the solid waste volumes increase such that site reaches permitted capacity.

Section 2.2 Description of Cap System

The existing site at the Stoney Mountain Road Landfill has limited top soils or underlying soils with clay content to achieve a cap permeability no greater than 1×10^{-5} cm/sec. In order to minimize cap size, it is planned to continue the fill at a 3 to 1 side slope to a cap area of one acre. This one acre cap area is to be closed with on site clay soils meeting the required permeability. Due to the cost of transporting soils from off site, it is anticipated that the cap system will consist of on site soils. Geomembrane design is not being considered at this time. Drawing No. 6 in the enclosed set of plans depicts the closure plan for the Stoney Mountain Road Landfill. The area, which has and will continue to received solid waste after October 9, 1991, is indicated on Drawing No. 6. This area is within the total landfill area base and there will only be one cap to this landfill covering all areas of the active fill. It is planned to continue the 3 to 1 side slopes using 30 ft. berms and 20 ft. terraces leading to the top of the fill with a cap of approximately one acre. This one acre cap will be required to comply with the cap designs sufficient to meet the 1×10^{-5} cm/sec

permeability. Drawing No. 12 gives the cap system design details. The proposed cap will contain a soil layer minimum 12 inches above waste to protect the cap followed by minimum 18 inch soil infiltration layer with minimum 6 inch top erosion layer. It is planned to install additional gas collection wells to tie to gas collection and flaring system soon to be constructed. Toe drains will be installed at edge of cap system. This toe drain will connect to site drainage system to remove drainage from the cap system out of the landfill area.

Section 2.3 Estimate of Largest Area requiring Cap

The active working areas of the Henderson County Stoney Mountain Road Landfill following October 9, 1993 consists of primarily two 10 acre areas. The landfill filling has progressed to where there are approximately 10 acres at the top of the site (elevation 2350) remaining to be filled. During 1986 the County built a recycling center and new haul road on the western slope inside the base area of the landfill. By constructing in this area, the County eliminated the use of air space above the recycling center and haul road previously approved for filling. The County plans to move the recycling center and reroute the haul road thus freeing up the air space on the western slope. This area, approximately 10 acres if utilized, will also be required to meet cap requirements. It is planned to utilize these two 10 acre areas utilizing the 3 to 1 slopes bringing the fill to a cap

of approximately one acre. This brings the total maximum area that would require cap to approximately one acre.

Section 2.4 Estimate of Maximum Inventory of Waste

During 1993 the Henderson County Stoney Mountain Road Landfill undertook a Phase I Landfill Gas Remediation study. As a part of the study solid waste volumes on site were estimated. The study estimated that 770,000 tons of solid waste have been disposed at this site. The County has only had scale data for the past few years. Current solid waste loads coming to the site are approximately 200 to 300 tons per day (at 300 tons per day this is 93,600 tons per year). Assuming that this rate of flow to the site remains constant until the end of 1997, it is expected that the site will receive an additional 374,400 tons of solid waste. This will bring the total site volume of solid waste to approximately 1,144,400 tons.

Section 2.5 Schedule for Closure

The following schedule is estimated for closure of the site:

Receipt of final waste loads	December 15, 1997
Begin site cleanup	December 15, 1997
Close landfill	December 31, 1997
Place final 12 inch intermittent soil cover	
establishing final contours	January 1-31, 1998
Begin construction of cap system &	
drainage system	February 1, 1998

Complete cap system & stabilization of landfill and borrow area	June 1, 1998
Achieve completion of construction & begin post closure activities	July 1, 1998

Section 2.6 Description of Local Characterization Study

The Local Characterization Study has been completed utilizing several sources of information on the area around the Henderson County Stoney Mountain Road Landfill. Drawing No. 7 depicts the Local Characterization Study information at a scale of 1 inch = 400 feet covering an area at least 2,000 feet from the landfill property. This plan has been developed utilizing the Henderson County Land Records maps (tax maps), as a base showing individual tracts and property lines in the area. On these base maps topographic information from the U.S. Geological Survey data and current landfill topographic information has been added. Information from the City of Hendersonville Water and Sewer Department on the location of existing water and sanitary sewer lines has been added to the base map. There are generally power lines running along roadways with a large power utility line running to the East of the Landfill along the top of Stoney Mountain. The large power line system has been shown on the base map. Residences have been added based on the best information available at this time. Water supply wells have also been located. In addition to the landfill, the State Prison adjacent to the

landfill has a wastewater treatment facility which has been located as a potential pollution source. This drawing has summarized local conditions and current land activities in the area of the Stoney Mountain Road Landfill. The area around the landfill continues to develop with several upscale residential subdivisions having begun development in recent years. The Stoney Mountain Road Landfill does not appear to have curtailed development in the area.

Section 2.7 Capacity of Site remaining from 10-9-93

During November 1993 an aerial photograph was taken of the landfill and current topographic map of the site prepared. This topographic map was compared to the 1992 topographic map. The site received from the Fall of 1992 to the Fall of 1993 approximately 70,000 tons of solid waste. The comparison of the two topographic maps indicated an annual fill rate of approximately 150,000 cy. This amount includes the soil daily cover and soil berms. The County has stopped using soil daily cover and in addition has lost several waste haulers who have opted to transport solid waste to other landfills. These two items have resulted in a significant reduction in filling rates at the site. By utilizing the current topographic information, solid waste volumes for scale data, compaction estimates, and planned filling sequence, the remaining capacity of the site can be estimated. It is felt that the site will be able to operate into 1997 with a remaining capacity calculated from October 9, 1993, of approximately

350,000 tons of solid waste or approximately 4 years capacity.

Section 2.8 Compliance Report

The Henderson County Stoney Mountain Road Landfill has had an excellent operating history with respect to compliance with the State issued permit No. 45-01. Only recently did any compliance issues develop with this landfill. The State has issued a compliance order for Landfill Gas Remediation at the site. The County detected and reported to the State a Landfill Gas migration and asked for assistance from the State in how to address the problem. The State issued a compliance order which has led to the County contracting with Cargan Resources which conducted the Phase I Remediation Study and at the writing of this report is in the design phase of a landfill gas collection and flaring system. To our knowledge the landfill gas situation is the only compliance order ever issued for the site. State inspection reports of the site have consistently listed the facility to be in compliance with the operating permit. Copies of the past five year's State inspection reports are included in the appendix.

Section 2.9 Cost Estimate for Closure

In estimated cost for closure the following items must be considered for the final cap system:

Working Bench Over Waste

Infiltration Layer

Soil Barrier

Geomembrane

Erosion Layer/Devices

Agricultural Planting

In addition to the cap system, the closure costs must consider the following:

Grading and Drainage

Road Improvements

Additional Ground Water Monitoring Wells

Additional Landfill Gas Wells

Landfill Gas Management System

The following assumptions are made with respect to closure of the Henderson County Stoney Mountain Road Landfill. On site soils will have sufficient clay content to meet cap requirements of 1×10^{-5} cm/sec permeability. Therefore, a total clay soil cap system is to be used utilizing on site soils. The below cost estimates consider this option. Following are cost estimates for the various aspects of closure of the site:

WORKING BENCE OVER WASTE

The County will be adding a soil layer on top of waste as areas transition from one area to another. The outside slopes will be established by the 30 ft. berms and additional soils on working bench on side slopes prior to cap construction will not be required. Therefore, the cost of the working bench at time of closure will be limited to the top of the site estimated at approximately one acre. On this area at least 12 inches of soils should be placed to protect infiltration layer. The cost of the 12 inch layer is as follows:

$$(1 \text{ Acre} \times 43,560 \text{ sf/acre} \times 1 \text{ ft}) / 27\text{sf/cy} = 1,613 \text{ cy}$$

$$1,613 \text{ cy} \times \$3.00/\text{cy} = \$4,839$$

Working Bench Costs at Closure \$4,839

INFILTRATION LAYER

Infiltration Layer using off site soils - Area to cap is one acres. Cost to move on site soils at \$ 3.00/cy. Depth of infiltration layer is 1.5 feet.

$$(1 \text{ acre} \times 43,560 \text{ sf/acre} \times 1.5 \text{ ft}) / 27\text{sf/cy} = 2,420 \text{ cy}$$

$$2,420 \text{ cy} \times \$ 3.00 / \text{cy} = \quad \quad \quad \$ 7,260$$

EROSION LAYER

Top Soil at \$10.00/cy

$$(1 \text{ acres} \times 43,560 \text{ sf/cy} \times 0.5 \text{ ft}) / 27\text{sf/cy} = 806 \text{ cy}$$

$$806 \text{ cy} \times \$10.00/\text{cy} = \quad \quad \quad \$8,060$$

AGRICULTURAL PLANTING

Seeding at \$1,500/acre x 1 acres = \$ 1,500

EROSION AND DRAINAGE

Erosion/Drainage at \$1,000/acre x 1 acres = \$ 1,000

GAS COLLECTION SYSTEM IMPROVEMENTS

Additional wells and gas lines \$100,000

GROUND WATER MONITORING WELLS

Three new wells previously installed \$ 0

ROAD IMPROVEMENTS

\$ 30,000

TOTAL ESTIMATE CLOSURE COSTS

\$152,659

Appendix C
Post Closure Plan

SECTION 3 POST CLOSURE PLAN

Section 3.1 Description of Monitoring and Maintenance Activities

The monitoring and maintenance activities during post closure for the Stoney Mountain Road Landfill will last for many years even possibly beyond the 30 year required post closure monitoring period. These activities will include but not be limited to ground water and surface water monitoring, landfill gas monitoring, erosion control system maintenance, roadway maintenance, and land cover maintenance.

Ground water monitoring must be conducted at least semi-annually and it is planned to continue weekly monitoring of landfill gas perimeter monitoring wells. Erosion control sedimentation basins will need periodic inspection and cleaning when basins are one half full. These basins will need to be maintained throughout post closure period.

The cap system will be monitored for settling, and any subsidence corrected as needed to achieve proper drainage. The cap will be inspected visually monthly to determine if maintenance is required. Vegetation cover of the site will be maintained by fertilization and mowing with area reseeding being conducted as necessary to prevent erosion of the side slopes and cap.

Section 3.2 Facility Contact throughout Post Closure Period

The following facility contacts will be available throughout post closure period:

Henderson County Manager (Currently Mr. David Thompson)
100 North King Street
Hendersonville, N.C. 28739
704-697-4809

Solid Waste Director (Currently Mr. Eldon Owen)
Stoney Mountain Road Landfill
c/o Henderson County
100 North King Street
Hendersonville, N.C. 28739
704-697-4505

Consultant Engineer (Currently Mr. Gary T. Tweed, P.E.)
William G. Lapsley and Associates, P.A.
P.O. Box 546
1635 Asheville Highway
Hendersonville, N.C. 28793
704-697-7334

Section 3.3 Description of Planned Post Closure Property Uses

The planned post closure uses of the Henderson County Stoney Mountain Road Landfill will include several activities. With the construction of a new Subtitle D lined landfill, it is very likely that a transfer station will be used. It is being considered to use the current landfill site for the transfer station. This will allow much of the current transportation of solid waste within the County to remain the same. In the same regard, it is anticipated that the site recycling center will remain open and operated similarly to current mode of operation. Currently the site contains the County Animal Shelter, and it is anticipated that these activities will continue. The landfill gas management system

will continue to operate during the post closure period. It is planned to develop markets for the gas which may result in future facilities being constructed to utilize the gas. This could include possibly electric generation equipment. The County is also considering developing some park type activities on the site including hiking trails. The landfill property is a mountain side and offers exceptional views from the top of the site. With all of these activities in mind, it is anticipated that a County office for onsite personnel will be maintained at the site.

Section 3.4 Cost Estimate for Post Closure Care

In estimating the cost for post closure care, the following items have been considered:

- Salaries, wages and fringes
- Upgrade to Landfill Gas System
- Landfill Gas Maintenance
- Fertilizer
- Mowing
- Professional Service
- Sediment and Erosion Control
- Road Maintenance
- Uniforms
- Training
- Drainage Maintenance
- Fill Settlement Areas

Public Liability Insurance

Ground/Surface Water Monitoring

The following assumptions have been made with respect to each of these activities.

SALARIES, WAGES, FRINGE

One employee is assumed for full-time employment on post closure maintenance of the sanitary landfill. This employee is responsible for supervision of third party contractors in accomplishing post closure care, as well as maintenance and operation of monitoring systems.

UPGRADE OF LANDFILL GAS SYSTEM and OPERATING COSTS

At the time of closure it is anticipated that the County will be well into an active landfill gas collection and disposal program. The County is beginning this system under contract with estimated annual costs of \$150,000. It is expected that the County may continue to contract this service for a few years then purchase the system and provide operation by County personnel. It is also assumed that expenditures will occasionally be made throughout the 30 year closure period for upgrade of the system. It is anticipated that annual operating costs will increase for a few years until gas generation starts to decrease. At this time annual operating costs should drop until the system is shut down at end of 30 year post closure period.

FERTILIZER

Hydrospreading of fertilizer is assumed for the entire 70 acres once per year in order to maintain vegetation.

MOWING

Mowing is assumed for the entire 70 acres to occur three times per year using bushhog type equipment.

PROFESSIONAL SERVICES

Engineering, consulting and legal services are assumed at \$6,000 per year.

SEDIMENTATION CONTROL

Clean out of sediment basins and drainage ditches is assumed to occur twice per year.

ROAD MAINTENANCE

Grading and filling of rough areas of the perimeter and internal road system is assumed to occur twice per year.

UNIFORMS

Uniform replacement and cleaning allowance for one employee at \$400 per year.

TRAINING

A training budget for one employee assumed at \$500 per year.

STORM DRAINAGE MAINTENANCE

Replacement and maintenance of storm water drainage systems assumed at \$1,500 per year.

FILL SETTLEMENT AREAS

It is assumed that final cover area will require eight

inches of fill material to prevent ponding of rainfall on the final cover. Estimated cost to fill and reseed area, \$5,000/yr.

LIABILITY INSURANCE

Public liability insurance is assumed with an annual premium of \$2,000.

GROUND/SURFACE WATER MONITORING

A total of six ground water and surface water monitoring points are to be sampled semi-annually. It is estimated that the subtitle D monitoring requirements will run approximately \$30,000 per year.

The next few pages are spread sheets which outlay estimated costs for closure and post closure care for the 30 year post closure period. These costs are the basis for the financial assurance plan covered in Section 6.

ENGINEER'S CERTIFICATION OF COMPLETION OF POST CLOSURE CARE

I, _____, P.E., as duly registered Professional Engineer in the State of North Carolina, have reviewed the post closure care for the **Henderson County Stoney Mountain Road Sanitary Landfill**, and hereby state that, to the best of my abilities, certify that the post closure care for the **Henderson County Stoney Mountain Road Landfill Permit Number 45-01** has been completed.

Signature _____ Registration No. 8464

Date _____

HENDERSON COUNTY 1 EMPLOYEE
 CLOSURE / POST CLOSURE COSTS 70 ACRES TOTAL AREA 6 GAS MONITORING WELLS
 STONEY MOUNTAIN ROAD LANDFILL 1 ACRE FINAL COVER 3 NEW GROUNDWATER WELL INSTALLATIONS
 1 EXISTING GW WELL, 2 SURFACE WATER SAMPLING
 6 TOTAL WATER SAMPLING POINTS

TOTAL # OF YEARS (BIG TO END OF TF) 34
 ANNUAL COST OF CAPITAL 6.50%
 ANNUAL INFLATION RATE 5.00%
 TRUST FUND ANNUAL ROR 4.50%
 LETTER OF CREDIT ANNUAL FEE 7.75%

YEAR	1994	1995	1996	1997	1998
I. CAPITAL - CLOSURE COSTS					
A. CAP SYSTEM				20159	
B. GRADING, SHEDING, AND DRAINAGE				2500	
C. ROAD IMPROVEMENTS				30000	
D. GROUND WATER MONITORING WELLS				0	
E. GAS MONITORING WELLS				50000	
F. LANDFILL GAS MANAGEMENT SYSTEM				50000	
TOTAL	0	0	0	152659	0
II. POST CLOSURE COSTS					
A. SALARIES, WAGES, FRINGES					30000
B. UPGRADE LANDFILL GAS SYSTEM					
C. LANDFILL GAS SYSTEM OPERATION					150000
D. FERTILIZER					5000
E. MOWING					8000
F. PROFESSIONAL SERVICES					6000
G. SEDIMENTATION CONTROL					1200
H. ROAD MAINTENANCE					7000
I. UNIFORMS					400
J. TRAINING					500
K. STORM DRAINAGE					1500
L. FILL SETTLEMENT AREAS					5000
M. PUBLIC LIABILITY INSURANCE					2000
N. GROUND SURFACE WATER MONITORING					30000
TOTAL	0	0	0	152659	246600
III. NPV SURETY REQD. TO END OF PCC	2,957,928	3,150,194	3,354,956	3,420,369	3,396,093
IV. SURETY OPTIONS					
A. TRUST FUND ANNUAL ROR 4.50%	34	33	32	31	30
TRUST FUND BALANCE:	86,998	183,618	290,727	404,344	521,658
COUNTY CASH FLOW, TRUST FUND	86,998	92,705	98,846	100,534	99,118
COUNTY CASH FLOW, TR FND & PCCC	86,998	92,705	98,846	253,193	345,718
NPV COUNTY CF, LOC & PCCC	3,119,558	3,235,331	3,352,922	3,472,016	3,444,504
B. LETTER OF CREDIT ANNUAL FEE 7.75%					
LETTER OF CREDIT CASH FLOW	229,239	244,140	260,009	265,079	263,197
CO. CF, LOC CF, & PCC COST	229,239	244,140	260,009	417,738	509,797
NPV CO. CF, LOC & PCCC	6,000,455	6,161,245	6,317,586	6,468,220	6,470,916

1999	2000	2001	2002	2003	2004	2005
0	0	0	0	0	0	0
31,500	33,075	34,729	36,465	38,288	40,200	42,213
			100,000			
150,000	150,000	150,000	50,000	52,500	55,125	57,888
5,250	5,513	5,788	6,078	6,381	6,700	7,036
8,400	8,820	9,261	9,724	10,210	10,721	11,257
6,300	6,615	6,946	7,293	7,658	8,041	8,443
1,260	1,323	1,389	1,459	1,532	1,608	1,689
7,350	7,718	8,103	8,509	8,934	9,381	9,850
420	441	463	486	511	536	563
525	551	579	608	638	670	704
1,575	1,654	1,736	1,823	1,914	2,010	2,111
5,250	5,513	5,788	6,078	6,381	6,700	7,036
2,100	2,205	2,315	2,431	2,553	2,680	2,814
31,500	33,075	34,729	36,465	38,288	40,200	42,213
251,430	256,912	261,827	267,418	273,789	280,578	287,807
3,365,409	3,327,659	3,282,131	3,228,051	3,262,086	3,289,543	3,309,556
29	28	27	26	25	24	23
642,384	766,161	892,546	1,020,992	1,154,743	1,293,491	1,436,823
97,251	94,870	91,907	88,282	87,806	86,785	85,124
348,681	351,372	353,734	355,700	363,595	371,363	378,981
3,322,678	3,189,971	3,045,948	2,890,201	2,722,364	2,635,722	2,535,681
260,819	257,894	254,365	250,174	252,812	254,940	256,491
512,249	514,395	516,192	517,592	428,600	439,518	450,298
6,381,729	6,284,292	6,178,376	6,063,778	5,940,332	5,897,853	5,841,698

2006	2007	2008	2009	2010	2011	2012
0	0	0	0	0	0	0
44,324	46,540	48,867	51,310	53,876	56,569	59,398
	50,000					25,000
60,775	63,814	67,008	63,655	60,472	57,448	54,576
7,387	7,757	8,144	8,552	8,979	9,428	9,900
11,830	12,411	13,031	13,683	14,367	15,085	15,839
8,865	9,308	9,773	10,262	10,775	11,314	11,880
1,773	1,862	1,955	2,052	2,155	2,263	2,376
10,342	10,899	11,402	11,972	12,571	13,200	13,860
591	621	652	684	718	754	792
739	776	814	855	898	943	990
2,216	2,327	2,443	2,566	2,694	2,828	2,970
7,387	7,757	8,144	8,552	8,979	9,428	9,900
2,955	3,103	3,258	3,421	3,592	3,771	3,960
44,324	46,540	48,867	51,310	53,876	56,569	59,398
203,498	263,672	224,356	228,873	233,952	239,602	270,837
3,321,180	3,273,384	3,261,798	3,244,942	3,221,912	3,191,734	3,128,359
22	21	20	19	18	17	16
1,584,193	1,732,525	1,883,054	2,035,010	2,187,437	2,339,158	2,487,166
82,714	77,043	72,565	67,218	60,851	53,286	42,746
286,211	340,715	296,921	296,092	294,803	292,888	313,583
2,421,569	2,292,760	2,101,074	1,940,722	1,770,777	1,591,075	1,401,607
257,391	253,687	252,789	251,483	249,698	247,359	242,448
460,889	517,360	477,145	480,356	483,650	486,961	513,285
5,771,108	5,685,341	5,537,529	5,420,323	5,292,287	5,152,636	5,000,597

	2013	2014	2015	2016	2017	2018	2019
	0	0	0	0	0	0	0
	62,368	65,486	68,761	72,199	75,809	79,599	83,579
					25,000		
	51,847	49,255	46,792	44,452	42,230	40,118	38,112
	10,395	10,914	11,460	12,033	12,635	13,266	13,930
	16,631	17,463	18,336	19,253	20,216	21,226	22,288
	12,474	13,097	13,752	14,440	15,162	15,920	16,716
	2,495	2,619	2,750	2,888	3,032	3,184	3,343
	14,552	15,280	16,044	16,846	17,689	18,573	19,502
	832	873	917	963	1,011	1,061	1,114
	1,039	1,091	1,146	1,203	1,263	1,327	1,393
	3,118	3,274	3,438	3,610	3,790	3,980	4,179
	10,395	10,914	11,460	12,033	12,635	13,266	13,930
	4,158	4,366	4,584	4,813	5,054	5,307	5,572
	62,368	65,486	68,761	72,199	75,809	79,599	83,579
	252,671	260,120	268,201	276,932	311,333	296,427	307,236
	3,079,031	3,019,048	2,947,085	2,861,714	2,736,392	2,617,831	2,480,754
	15	14	13	12	11	10	9
	2,631,085	2,768,738	2,897,466	3,014,007	3,112,070	3,188,685	3,237,573
	31,996	19,255	4,135	(13,845)	(37,568)	(63,428)	(94,602)
	284,668	279,375	272,336	263,087	273,765	232,999	212,634
	1,179,128	971,104	754,850	531,580	303,046	48,978	(180,837)
	238,625	233,976	228,399	221,783	212,070	202,882	192,258
	491,296	494,097	496,600	498,715	523,404	499,309	499,495
	4,812,350	4,633,857	4,440,961	4,233,023	4,009,455	3,746,666	3,490,891

	2020	2021	2022	2023	2024	2025	2026
	0	0	0	0	0	0	0
	87,758	92,146	96,753	101,591	106,670	112,004	117,604
			25,000				
	36,207	34,396	32,677	31,043	29,491	28,016	26,615
	14,626	15,358	16,125	16,932	17,778	18,667	19,601
	23,402	24,572	25,801	27,091	28,445	29,868	31,361
	17,552	18,429	19,351	20,318	21,334	22,401	23,521
	3,510	3,686	3,870	4,064	4,267	4,480	4,704
	20,477	21,501	22,576	23,704	24,890	26,134	27,441
	1,170	1,229	1,290	1,355	1,422	1,493	1,568
	1,463	1,536	1,613	1,693	1,778	1,867	1,960
	4,388	4,607	4,838	5,080	5,334	5,600	5,880
	14,626	15,358	16,125	16,932	17,778	18,667	19,601
	5,851	6,143	6,450	6,773	7,111	7,467	7,840
	87,758	92,146	96,753	101,591	106,670	112,004	117,604
	318,787	331,106	369,221	358,165	372,969	388,668	405,300
	2,323,216	2,143,119	1,913,201	1,679,394	1,415,586	1,118,932	786,362
	8	7	6	5	4	3	2
	3,250,758	3,217,910	3,121,130	2,945,144	2,662,153	2,227,610	1,557,108
	(132,506)	(179,132)	(241,586)	(316,437)	(415,522)	(554,339)	(770,745)
	186,281	151,974	127,635	41,727	(42,554)	(165,672)	(365,446)
	(405,225)	(617,846)	(809,979)	(990,263)	(1,096,358)	(1,125,067)	(1,032,525)
	180,049	166,092	148,273	130,153	109,708	86,717	60,943
	498,836	497,197	517,494	488,318	482,677	475,385	466,343
	3,218,304	2,928,658	2,621,823	2,274,747	1,934,288	1,577,340	1,204,482

2027	2028
0	0
123,484	129,658
25,284	24,020
20,581	21,610
32,929	34,576
24,697	25,932
4,939	5,186
28,813	30,254
1,646	1,729
2,058	2,161
6,174	6,483
20,581	21,610
8,232	8,644
123,484	129,658
422,503	441,520
414,573	0
1	0
414,573	0
(1,212,605)	(433,228)
(789,702)	8,291
(734,194)	7,785
32,129	0
455,033	441,520
816,531	414,573

Appendix D
Water Quality Monitoring Plan

SECTION 4 WATER QUALITY MONITORING PLAN

Section 4.1 Ground Water Monitoring System

The Henderson County Stoney Mountain Road Landfill has an existing water quality monitoring program (presently under contract to Pace Labs, Inc.) consisting of four ground water monitoring wells (one upgradient well and three down gradient wells) and three surface water monitoring locations. A copy of the Pace Labs, Inc. water quality monitoring program is included in the appendix to this report. The existing ground water monitoring wells are located on drawing No. 1 and 8 of the enclosed drawings. There are three old existing wells that are deep approximately 70 feet. A review of the existing ground water monitoring program by Mr. Bobby Lutfey with the Division of Solid Waste recommended that additional ground water monitoring wells be located closer to the waste boundary and at a shallower depth such that sampling of the upper most aquifer be achieved. It was proposed to install three downgradient ground water monitoring wells in the order of 20 to 30 feet deep into the upper most aquifer. These well have been installed and the location of the new ground water monitoring wells are shown on drawing No. 8. The County is now conducting the semi-annual monitoring on these new ground water monitoring wells. The existing wells will be kept but not routinely monitored. In the event that contamination is detected in the new wells, then the existing wells could be reactivated in the sampling program. There are also three

surface water quality monitoring locations near the existing ground water monitoring wells. These are shown on drawings No. 1 and No. 8 and will be discussed further below.

Existing water quality sampling results of the deep ground water monitoring wells and surface water quality stations (see the appendix for past five years sampling data) have shown no significant contamination. Sampling results for the past five years are shown in the appendix of this report. Only iron and manganese concentrations appear to be elevated and are present in old upgradient ground water monitoring well sampling results. Review of the data indicates that the elevated iron and manganese levels are due to natural soil conditions in the area and not as a result of solid waste.

The new ground water monitoring wells have been constructed in accordance with N.C. Well Construction Standards (15A NCAC 2C). The ground water monitoring wells are to be sampled semi-annually in accordance with T15A:13b.1632. Sampling collection, preservation and shipment, chain of custody control, quality assurance, and quality control procedures are to be followed. Ground water elevations are to be measured in each well at each sampling event prior to purging the well. Each well has been located by a N.C. Registered Land Surveyor. The existing wells on drawings No. 1 and 8 have been located by registered surveyors. The initial base line sampling of the new wells has detected some contamination, and the County has been

ASSESSMENT MONITORING PROGRAM

Where a statistically significant increase over background has been detected for one or more of the Appendix I constituents or whenever a violation of the N.C. Ground Water Quality Standards (15A NCAC 2L, .0202) has occurred, the County will initiate assessment monitoring. The County will sample all ground water monitoring wells within 90 days of initiation of assessment monitoring and annually thereafter for all constituents identified in Appendix II of 40 CFR Part 258 "Appendix II List of Hazardous Inorganic and Organic Constituents." A minimum of one sample from each downgradient well will be collected and analyzed during each sampling event. For any Appendix II constituents detected a minimum of four independent samples from each well (background and downgradient) will be collected and analyzed to establish background for the new constituents. Within 14 days after obtaining results of the sampling, the County will submit a report to the Division and place a notice in the operating record identifying the Appendix II constituents that have been detected. Within 90 days and semiannually thereafter, the County will sample all ground water monitoring wells for all Appendix I constituents and those Appendix II constituents that have been detected. A report of each sampling will be submitted to the Division and placed in the operating record. At least one sample from each well (background and downgradient) shall be collected and analyzed during each of

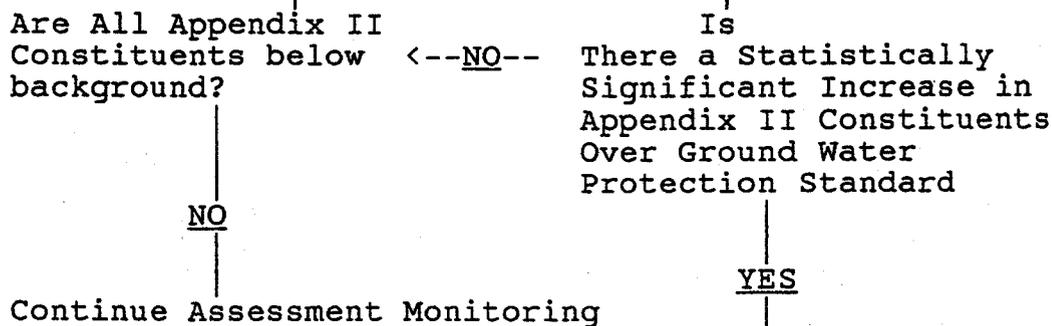
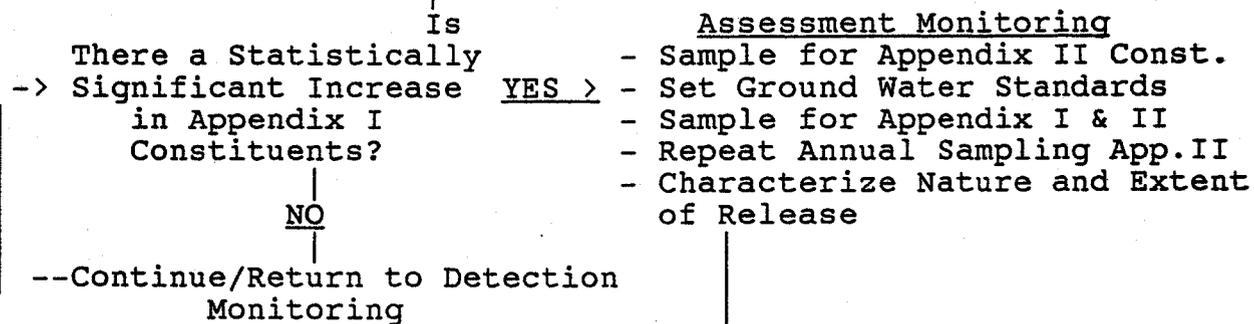
GROUND WATER MONITORING AND CORRECTIVE ACTION PROGRAM

Ground Water Monitoring Program

- Install Monitoring System
- Establish Sampling and Analysis Program

Detection Monitoring

- Begin Semi Annual Monitoring for Appendix I Constituents



CORRECTIVE ACTION PROGRAM

- Assess Corrective Measures
- Evaluate Corrective Measures and Select Remedy
- Implement Remedy

Section 4.2 Surface Water Monitoring System

The County has in place monitoring of surface waters on the landfill property at four locations near the four existing ground water monitoring wells. Sampling results have not indicated any significant levels of contamination. Iron and manganese have been detected at all locations and, as with ground water monitoring results, have been attributed to natural background conditions. With the degree of sampling required for the ground water monitoring program, it is planned to reduce the stream sampling locations to one upgradient and one down gradient site. Sampling of the surface water streams will be conducted at the same semi-annual frequency as the ground water wells. Upon detection of any significant levels of contamination in the ground water wells that requires assessment monitoring of Appendix II constituents, then it is planned to sample the two surface water streams as well for Appendix II. Should there be no contamination detected, then the surface water streams will return to semi-annual detection monitoring. The two planned surface water stream sampling locations are shown on drawing No. 8.

REVISED 11-24-96



I, David A. Hunter, as a Licensed Geologist in the State of North Carolina, having been authorized to review the Water Quality Monitoring Plan for the Henderson County Stoney Mountain Road Sanitary Landfill, hereby certify, to the best of my ability, that the Water Quality Monitoring Plan, if implemented by Henderson County, should be effective in providing early detection of potential releases of regulated substances in the uppermost aquifer. The Licensed Geologist certification is part of the correspondence dated September 30, 1996 between F&R and Lapsley & Associates.

Signature *David A. Hunter* Registration No. 1171
Date 9/30/96



Section 4.3 Water Quality Monitoring Plan Certification

GEOLOGIST'S CERTIFICATION

I, _____, as duly registered Professional Geologist in the State of North Carolina, having been authorized to prepare the Water Quality Monitoring Plan for the Henderson County Stoney Mountain Road Sanitary Landfill, hereby state that, to the best of my abilities, certify that the Water Quality Monitoring Plan if implemented by Henderson County should be effective in providing early detection of any release of hazardous constituents to the uppermost aquifer.

Signature _____ Registration No. _____

Date _____

Section 4.3 Water Quality Monitoring Plan Certification

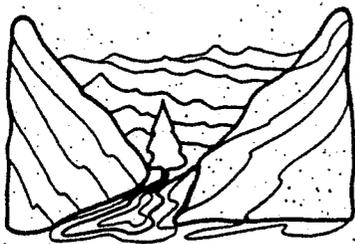
ENGINEER'S CERTIFICATION

I, Gary T. Tweed, P.E., as duly registered Professional Engineer in the State of North Carolina, having been authorized to prepare the Water Quality Monitoring Plan for the Henderson County Stoney Mountain Road Sanitary Landfill, hereby state that, to the best of my abilities, certify that the Water Quality Monitoring Plan if implemented by Henderson County should be effective in providing early detection of any release of hazardous constituents to the uppermost aquifer.

Signature *Gary T. Tweed* Registration No. 8464

Date *3-22-94*





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Consulting Engineers and Land Planners

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November 6, 1995

William G. Lapsley, P.E.
Gary Tweed, P.E.
John B. Jeter, P.E.
Philip Ward, L.S.A.

Mr. Bobby Lutfy
Hydrogeologist
Solid Waste Section
N.C. Division of Solid Waste Management
P.O. Box 27687
Raleigh, N.C. 27611-7687

Ref: Hydrogeologic Review
Transition Plan
Henderson County Stoney Mountain Road Landfill
Permit # 45-01

Dear Mr. Lutfy:

Reference is made to your September 26, 1995 letter of the Hydrogeologic Review of the Local Area Study and Water Quality Monitoring Plan of the Transition Plan for the Henderson County Landfill (Permit # 45-01). The following response is offered in the order of your review comments:

Local Area Study

You stated that there was not text in the Transition Plan concerning the Local Area Study. The Transition Plan did contain text on this matter and is located in Section 2.6 page 22 of the report. The text details how the Local Characterization Study was developed.

(i) Sheet 7 was developed using topo information from the U.S.G.S. map for the area and our on site topo information. The map was generated showing only the 100 ft contour lines. We have revised the map adding the 50 ft. contour lines. Due to the scale of the drawing adding additional topo would tend to clutter the drawing. The facility plans for the site are on a larger scale and 2 ft. contours.

(ii) There are no surface water intakes in the study area and the majority of the area is served by the City of Hendersonville water system. There are a few private residential wells in the area but none within the landfill property boundary. Notes to these items have been added to Sheet 7. The majority of the private wells are located upgradient of the site near the top of Stoney Mountain where City water is not available.

(iii) Henderson County is served by Public Service Gas and



Mr. Bobby Lutfy
November 6, 1995
Page Two

Southern Bell telephone and generally have gas and telephone lines following the major highway routes. Underground gas and telephone lines would likely follow NC 191, SR 1381, and SR 1383 which fall within the Study Area. Notes to this effect have been added to the plan.

(v) The only other sources of contamination known at this time are the State D.O.T. and D.O.C. facilities adjacent to the landfill to the North. The D.O.C. has eliminated its wastewater treatment plant with a lift station and force main. The plan has been revised to show these facilities. The County animal shelter located adjacent to the solid waste boundary has septic drainfields.

Since submittal of the Transition Plan the site ground water monitoring wells have been survey and bench marks established. The plan has been revised to reflect this information.

Water Quality Monitoring Plan

Henderson County has been working with Pace Labs, Inc. in the sampling program for the Landfill. Since the Transition Plan was submitted new ground water wells have been installed and the four baseline samples taken. The plan sheet No. 8 of 12 was revised to show the new wells, old wells, and surface water sampling locations. Sampling of the surface water locations has been the same as ground water wells. We are working with Pace Labs, Inc. on the development of the water quality monitoring plan and will submit the plan upon receipt from Pace Labs, Inc.

Sampling and Analysis Plan

Pace Labs, Inc. in addition to the Water Quality Monitoring Plan will be providing the response to your comments on the sampling and analysis plan.

Initial Sampling Results

Froeling and Robertson were contracted to install the new monitoring wells and to provide the well completion records and well information needed for the baseline report. A copy of this information has just been completed and is enclosed.

The third and fourth sampling events were performed in March and April 1995 and copies of these results have previously been forwarded to your office. The County did not conduct any Appendix II sampling. The County had advised your office by letter dated January 12, 1995 of the initial sampling results which found some contamination, and requested your office advise of any additional action that was needed. Since there was not response from your

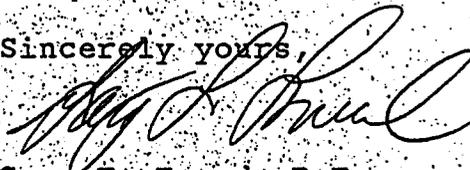
Mr. Bobby Lutfy
November 6, 1995
Page Three

office the County did not schedule the Appendix II sampling. It is not time for the site to be scheduled for the next semi-annual sampling event and the site ground water monitoring wells will be sampled for the Appendix II constituents.

Enclosed are copies of the revised plans and baseline information in accordance with reference to your review. We are in the process of addressing several items on the Transition Plan as result of review by Mr. Greg Eades with your Division. Since it has been nearly two years since the original Transition Plan was developed there are many areas of the plan which are outdated. A revised Transition Plan is being developed which will incorporated the revised Water Quality Monitoring Plan and these items address above.

Should you have any questions or need additional information, please contact our office.

Sincerely yours,



Gary T. Tweed, P.E.

State of North Carolina
Department of Environment,
Health and Natural Resources
Division of Solid Waste Management



James B. Hunt, Jr., Governor
Jonathan B. Howes, Secretary
William L. Meyer, Director

September 26, 1995

Mr. Gary Tweed
William G. Lapsley & Associates
1635 Asheville Highway
Hendersonville, N.C. 28739

RE: Hydrogeologic Review Of The Local Area Study And Water Quality
Monitoring Plan Of The Transition Plan For The Henderson
County Landfill (Permit # 45-01)

Dear Mr. Tweed,

The Solid Waste Section Hydrogeologic Unit has reviewed the Local Area Study and Water Quality Monitoring Plan portions of the Transition Plan for the Henderson County Landfill. There are some items that need additional clarification. Please address the following questions and comments:

LOCAL AREA STUDY

There was no text in the report that addressed the Local Area Study requirements. The Local Characterization Study Drawing (Sheet 7) did not clearly provide all the information required by Rule .1629(b)(2)(A)(i) through (v).

- (i): Sheet 7 shows little topographic information for the area around the landfill. It does not appear to show current topographic information for the permitted facility.
- (ii): Additional information is needed on ground and surface water intakes in the vicinity of the landfill. A number of the residences on Sheet 7 do not appear to be located near a water line, yet they are not shown to be using private wells. If these residences are assumed to be using wells, this should be indicated on the margin of the drawing. Are there any surface water intakes in the study area?
- (iii) Are there any underground utility lines other than the water lines and sewer lines shown of Sheet 7?

Mr. Gary Tweed
Henderson Transition Plan
Page 2

- (v) Are there any known or potential sources of contamination in the study area?
- The on-site survey control benchmarks should also be shown on a facility map.

WATER QUALITY MONITORING PLAN

- The text and drawings of the Water Quality Monitoring Plan need to reflect the revised upgraded monitoring system that was actually installed at the landfill.
- Clarification is needed on the location of the four surface water sampling locations that have been sampled in the past.
- Surface water sampling is required to be done at the same time (semi-annually) and for the same parameters as the ground-water samples.
- Rule .1623(b)(3)(C) requires certification of the water quality monitoring system by a Licensed Geologist rather than a Professional Engineer.

SAMPLING AND ANALYSIS PLAN

- Some of the proposed analytical methods and PQLs are inconsistent with the guidelines established by the Solid Waste Section as outlined in the memos to MSWLF Owners and Operators dated June 24, 1994 and January 15, 1995.
- Regular ICP method 6010 is not approved for low-level analysis for the following metals: Antimony, Beryllium, Chromium, Cobalt, Silver, Thallium, and Vanadium.
- The proposed PQLs are too high for Barium, Beryllium, Cadmium, and Nickel.

Overall the Sampling and Analysis Plan appeared very good. Should there be any discrepancies between the plan and the Solid Waste Management Rules and policies, then the rules and policies are to take precedence.

Mr. Gary Tweed
Henderson Transition Plan
Page 3

INITIAL SAMPLING RESULTS

- No Well Completion Records or boring logs have been submitted for the new monitoring wells.
- No information on the in-situ hydraulic conductivity, porosity, and effective porosity has been provided for each of the monitoring wells in the approved monitoring system.
- No information on the rate and direction of ground-water flow has been provided for each monitoring well sampled.
- The laboratory data sheets do not indicate the analytical methods used for the analyses.

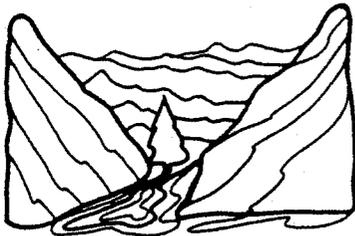
The Solid Waste Section has received water quality sampling data for sampling episodes for December 5, 1994 and January 31, 1995. We have not received data for the third and fourth sampling events that make up the baseline sampling event. This data was required to be reported to the Solid Waste Section on or before April 9, 1995. Henderson County needs to submit this data immediately.

Although the complete baseline sampling report has not been received, the data from the first two sampling events indicates that the N.C. Groundwater Standards have been exceeded for several parameters. Therefore Henderson County should have sampled the monitoring wells for the Appendix II constituent list on or before July 9, 1995.

If you or Henderson County have any questions regarding this letter, please contact me at (919) 733-0692, extension 258. Please provide a response to this letter as soon as possible, so the Solid Waste Section can complete its technical review of the Henderson County Transition Plan.

Sincerely, *Bobby Lutfy*
Bobby Lutfy, Hydrogeologist
Solid Waste Section

cc: Ed Mussler, Solid Waste Section
Jim Patterson, SWS - Asheville
David Thompson, Henderson County



William G. Lapsley & Associates, P.A.

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January 10, 1996

William G. Lapsley, P.E.
Gary Tweed, P.E.
John B. Jeter, P.E.
Philip Ward, L.S.A.

Mr. Bobby Lutfy
Hydrogeologist
Solid Waste Section
N.C. Division of Solid Waste Management
P.O. Box 27687
Raleigh, N.C. 27611-7687

Ref: Sampling and Analysis Plan
Hydrogeologic Review
Transition Plan
Henderson County Stoney Mountain Road Landfill
Permit # 45-01

Dear Mr. Lutfy:

In follow up to our earlier response date November 6, 1995 to your September 26, 1995 letter of the Hydrogeologic Review of the Local Area Study and Water Quality Monitoring Plan of the Transition Plan for the Henderson County Landfill (Permit # 45-01), enclosed is a revised Sampling and Analysis Plan prepared by Pace Labs. This information is being submitted as requested in your September 26, 1995 review.

Should you have any questions or need additional information, please contact our office.

Sincerely yours,

Gary T. Tweed, P.E.



Solid Waste Landfill Monitoring
 Sampling and Analysis Plan
 (Revised: 12/95)

III. Test Methodologies

Pace Analytical Services, Inc. will utilize only EPA and State approved methodologies in the analysis of groundwater samples for compliance purposes for solid waste landfills. We will make every reasonable effort to obtain the lowest detection limits based on the method required and the nature of the sample matrix. Analytical problem arising from sample matrix interferences that can not be overcome will be fully documented in the analytical report.

A. Appendix I Testing

Where possible, PACE will perform all landfill monitoring for Appendix I organic constituents by method 8260 as published in the EPA manual Test Methods for Evaluating Solid Waste, SW846 third edition. When the need for increased sensitivity is required, 25 mls spargers may be employed in method 8260 or alternate approved methods providing greater sensitivity may be used.

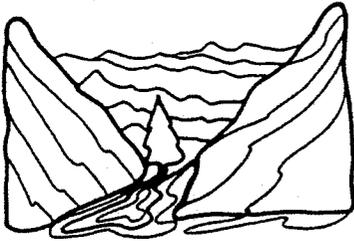
B. Methodology & PQLs

Inorganic Constituent List:

<u>Analyte</u>	<u>Test Method</u>	<u>Expected PQL</u>
Antimony	SW846, 7740	.004 mg/L
Arsenic	SW846, 7060	.005 mg/L
Barium	SW846, 6010	.10 mg/L
Beryllium	SW846, 7091	.002 mg/L
Cadmium	SW846, 7131	.001 mg/L
Chromium	SW846, 7201	.005 mg/L
Cobalt	SW846, 7191	.010 mg/L
Copper	SW846, 6010	.010 mg/L
Lead	SW846, 6010	.005 mg/L
Nickel	SW846, 7421	.050 mg/L
Selenium	SW846, 7761	.005 mg/L
Silver	SW846, 7041	.001 mg/L
Thallium	SW846, 7841	.002 mg/L
Vanadium	SW846, 7911	.040 mg/L
Zinc	SW846, 6010	.010 mg/L

Organic Constituent List:

<u>Analyte</u>	<u>Test Method</u>	<u>Expected PQL (ug/l)</u>
Acetone	SW846, 8260	100
Acrylonitrile	SW846, 8260	100
Benzene	SW846, 8260	5
Bromochloromethane	SW846, 8260	5
Bromodichloromethane	SW846, 8260	5
Bromoform	SW846, 8260	5
Carbon Disulfide	SW846, 8260	5
Carbon Tetrachloride	SW846, 8260	5
Chlorobenzene	SW846, 8260	5
Chloroethane	SW846, 8260	10
Chloroform	SW846, 8260	5
Chlorodibromomethane	SW846, 8260	5
DBCP	SW846, 8260	5
EDB	SW846, 8260	5
o-Dichlorobenzene	SW846, 8260	5
p-Dichlorobenzene	SW846, 8260	5
t-1,4-Dichloro-2-butene	SW846, 8260	5
1,1-Dichloroethane	SW846, 8260	5
1,2-Dichloroethane	SW846, 8260	5
1,1-Dichloroethene	SW846, 8260	5
c-1,2-Dichloroethene	SW846, 8260	5
t-1,2-Dichloroethene	SW846, 8260	5
1,2-Dichloropropane	SW846, 8260	5
c-1,3-Dichloropropene	SW846, 8260	5
t-1,3-Dichloropropene	SW846, 8260	5
Ethylbenzene	SW846, 8260	5
2-Hexanone	SW846, 8260	5
Bromomethane	SW846, 8260	10
Chloromethane	SW846, 8260	10
Dibromomethane	SW846, 8260	5
Methylene Chloride	SW846, 8260	10
MEK	SW846, 8260	100
Iodomethane	SW846, 8260	10
MIBK	SW846, 8260	50
Styrene	SW846, 8260	5
1,1,1,2-Tetrachloroethane	SW846, 8260	5
1,1,2,2-Tetrachloroethane	SW846, 8260	5
Tetrachloroethene	SW846, 8260	5
Toluene	SW846, 8260	5
1,1,1-Trichloroethane	SW846, 8260	5
1,1,2-Trichloroethane	SW846, 8260	5
Trichloroethene	SW846, 8260	5
CFC-11	SW846, 8260	5
1,2,3-Trichloropropane	SW846, 8260	5
Vinyl Acetate	SW846, 8260	50
Vinyl Chloride	SW846, 8260	10
Xylene (Total)	SW846, 8260	5



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William G. Lapsley, P.E.
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John B. Jeter, P.E.
Philip Ward, L.S.A.

June 3, 1996

Mr. Walter L. Miller
Pace, Inc.
54 Ravenscroft Drive
Asheville, North Carolina 28801

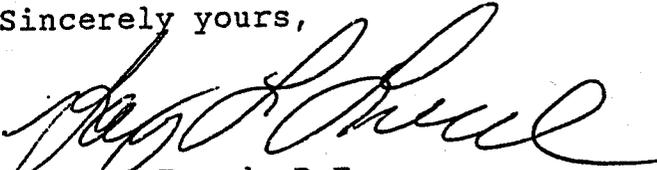
Ref: Sampling and Analysis Plan
Henderson County Stoney Mountain Road Landfill
Permit #45-01

Dear Mr. Miller:

Enclosed is a copy of a May 24, 1996 letter from Mr. Bobby Lutfey, DEHNR Solid Waste Section, requesting revisions to the Sampling and Analysis Plan prepared by Pace, Inc. for the Henderson County Stoney Mountain Road Landfill. A copy of your plan is enclosed for reference. It is requested that you review this information and make revisions as appropriate. You may wish to discuss the requested revisions with Mr. Lutfey.

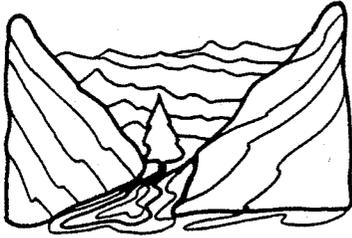
Upon completion of the revisions please forward a copy to our office. Should there be any question or additional information needed, please contact our office at 704-697-7334.

Sincerely yours,



Gary P. Tweed, P.E.





William G. Lapsley & Associates, P.A.

Consulting Engineers and Land Planners

1635 Asheville Highway
Post Office Box 546
Hendersonville, North Carolina 28793
704-697-7334 • FAX 704-697-7333

June 3, 1996

William G. Lapsley, P.E.
Gary Tweed, P.E.
John B. Jeter, P.E.
Philip Ward, L.S.A.

Mr. Bobby Lutfy
Hydrogeologist
Solid Waste Section
N.C. Division of Solid Waste Management
P.O. Box 27687
Raleigh, N.C. 27611-7687

Ref: Additional Hydrogeologic Review (Letter dated May 24, 1996)
Transition Plan
Henderson County Stoney Mountain Road Landfill
Permit # 45-01

Dear Mr. Lutfy:

Reference is made to your May 24, 1996 letter of the additional Hydrogeologic Review of the revisions to the Local Area Study and Water Quality Monitoring Plan of the Transition Plan for the Henderson County Landfill (Permit # 45-01). The following response is offered in the order of your review comments:

WATER QUALITY MONITORING PLAN (WQMP)

You stated that you had not received any revised test of the WQMP addressing your letter of September 26, 1995. The entire Transition Plan including the WQMP was revised and resubmitted to Mr. Greg Eades on November 30, 1995. Reference is also made to our responses to you dated November 6, 1995 and January 10, 1996. (copies enclosed). It is apparent that you were not given a copy of the revised Transition Plan; therefore, enclosed is a copy of the revised Section 4 Water Quality Monitoring Plan.

FROEHLING & ROBERTSON REPORT OF OCTOBER 25, 1995

We are forwarding a copy of your review comments to F & R concerning porosity requesting that they make the appropriate revisions to their October 25, 1996 report. Revisions will be forwarded to your office upon receipt.

SAMPLING & ANALYSIS PLAN BY PACE LABS

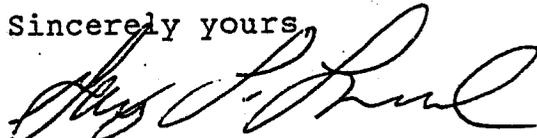
We are forwarding a copy of your review comments to Pace Labs concerning test methods for the inorganic constituent list. Revisions will be forwarded to your office upon receipt.



Mr. Bobby Lutfy
June 3, 1996
Page Two

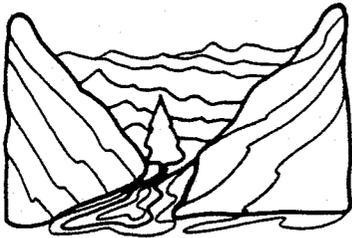
Should you have any questions or need additional information,
please contact our office.

Sincerely yours,



Gary T. Tweed, P.E.

cc David Nicholson



William G. Lapsley & Associates, P.A.

Consulting Engineers and Land Planners

1635 Asheville Highway
Post Office Box 546
Hendersonville, North Carolina 28793
704-697-7334 • FAX 704-697-7333

June 3, 1996

William G. Lapsley, P.E.
Gary Tweed, P.E.
John B. Jeter, P.E.
Philip Ward, L.S.A.

Mr. Ron Waldrup
Froehling & Roberston, Inc.
549 Sweeten Creek Industrial Park
P.O. Box 2058
Asheville, North Carolina 28802

Ref: Ground Water Monitoring Well Installation Report (10-25-95)
Henderson County Stoney Mountain Road Landfill
Permit #45-01

Dear Mr. Waldrup:

Enclosed is a copy of a May 24, 1996 letter from Mr. Bobby Lutfey, DEHNR Solid Waste Section, requesting revisions to the F & R October 25, 1995 report of Monitoring Well Installation and Hydrologic Evaluations for the Henderson County Stoney Mountain Road Landfill. A copy of your report is enclosed for reference. It is requested that you review this information and make revisions as appropriate. You may wish to discuss the requested revisions with Mr. Lutfey.

Upon completion of the revisions please forward a copy to our office. Should there be any question or additional information needed, please contact our office at 704-697-7334.

Sincerely yours,

Gary T. Tweed, P.E.



State of North Carolina
Department of Environment,
Health and Natural Resources
Division of Solid Waste Management



James B. Hunt, Jr., Governor
Jonathan B. Howes, Secretary
William L. Meyer, Director

May 24, 1996

Mr. Gary Tweed
William Lapsley & Associates
1635 Asheville Highway
Hendersonville, N.C. 28739

RE: Additional Hydrogeologic Review Of The Transition Plan For The
Henderson County MSW Landfill, Permit # 45-01

Dear Mr. Tweed,

The Solid Waste Section Hydrogeologic Unit has completed a review of the revisions to the Local Area Study and Water Quality Monitoring Plan portions to the Transition Plan for the Henderson County Landfill. Further revisions are still needed for the Water Quality Monitoring Plan. Please provide responses to the following comments:

WATER QUALITY MONITORING PLAN (WQMP)

As of this date the Solid Waste Section has still not received any revised text for the WQMP. The items raised in my initial review letter of September 26, 1995 still need to be addressed.

There are a couple of corrections needed to the Froehling & Robertson Report of October 25, 1995:

- The F&R Report apparently estimated effective porosity based upon the proportion of the volume of voids occupied by water. For the purposes of hydrogeologic study effective porosity is the water that is not bound to the soil particles but is free to move through the soil media. Typically this is measured by the water that will drain by gravity from a soil sample. Because of the long time periods required to make actual laboratory measurements, effective porosity values are generally estimated based on soil analyses. Generally effective porosity is significantly less than total porosity. The effective porosity values in the report need to be revised consistent with this understanding of effective porosity.

Mr. Gary Tweed
Henderson Transition Plan
Page 2

- Because effective porosity more accurately represents the water available for movement through the soil media, effective porosity (rather than total porosity) should be used to calculate ground-water seepage velocity.
- Due to the factors outlined in the previous two points, the seepage velocities need to be recalculated based upon revised effective porosity values.

The revised Sampling and Analysis Plan submitted January 10, 1996 with the (12/95 revised) test methodologies prepared by PACE has several errors in the test methods for the inorganic constituent list: Antimony, Chromium, Cobalt, Lead, Nickel, Selenium, and Silver.

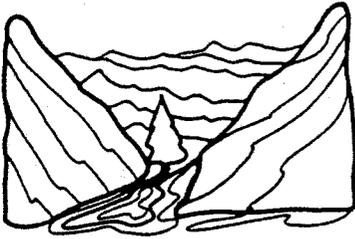
Please provide the corrections and revisions to the Transition Plan as soon as possible, so the Solid Waste Section can complete our technical review. If you have any questions regarding this letter, please contact me at (919) 733-0692, extension 258.

Sincerely,

Bobby Lutfy

Bobby Lutfy
Hydrogeologist
Solid Waste Section

cc: Greg Eades, Solid Waste Section
David Thompson, Henderson County



William G. Lapsley & Associates, P.A.

Consulting Engineers and Land Planners

1635 Asheville Highway
Post Office Box 546
Hendersonville, North Carolina 28793
704-697-7334 • FAX 704-697-7333

June 12, 1996

William G. Lapsley, P.E.
Gary Tweed, P.E.
John B. Jeter, P.E.
Philip Ward, L.S.A.

Mr. Bobby Lutfy
Hydrogeologist
Solid Waste Section
N.C. Division of Solid Waste Management
P.O. Box 27687
Raleigh, N.C. 27611-7687

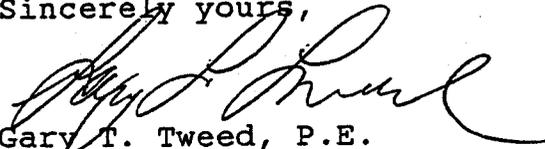
Ref: Additional Hydrogeologic Review (Letter dated May 24, 1996)
Transition Plan
Henderson County Stoney Mountain Road Landfill
Permit # 45-01

Dear Mr. Lutfy:

Reference is made to your May 24, 1996 letter and our June 3, 1996 response concerning the additional Hydrogeologic Review of the revisions to the Local Area Study and Water Quality Monitoring Plan of the Transition Plan for the Henderson County Landfill (Permit # 45-01). Enclosed is the revised portion of the Sampling and Analysis Plan concerning Test Methodologies which has been prepared by Pace, Inc. This should be incorporated into your copy of the Sampling and Analysis Plan for the Henderson County Stoney Mountain Road Landfill Transition Plan.

Should you have any questions or need additional information, please contact our office.

Sincerely yours,


Gary T. Tweed, P.E.

cc David Nicholson



**Solid Waste Landfill Monitoring
Sampling and Analysis Plan
(Revised 5/96)**

III. Test Methodologies

Pace Analytical Services, Inc. will utilize only EPA and State approved methodologies in the analysis of groundwater samples for compliance purposes for solid waste landfills. We will make every reasonable effort to obtain the lowest detection limits based on the method required and the nature of the sample matrix. Analytical problem arising from sample matrix interference's that can not be overcome will be fully documented in the analytical report.

A. Appendix I Testing

Where possible, PASI will perform all landfill monitoring for Appendix I organic constituents by method 8260 as published in the EPA manual Test Methods for Evaluating Solid Waste, SW846 third edition. When the need for increased sensitivity is required, 25 mls spargers may be employed in method 8260 or alternate approved methods providing greater sensitivity may be used.

B. Methodology & PQLs

Inorganic Constituent List:

<u>Analyte</u>	<u>Test Method</u>	<u>Expected POL</u>
Antimony	SW846, 7041	.004 mg/L
Arsenic	SW846, 7060	.005 mg/L
Barium	SW846, 6010	.10 mg/L
Beryllium	SW846, 7091	.002 mg/L
Cadmium	SW846, 7131	.001 mg/L
Chromium	SW846, 7191	.005 mg/L
Cobalt	SW846, 7201	.010 mg/L
Copper	SW846, 6010	.010 mg/L
Lead	SW846, 7421	.005 mg/L
Nickel	SW846, 6010	.050 mg/L
Selenium	SW846, 7740	.005 mg/L
Silver	SW846, 7761	.001 mg/L
Thallium	SW846, 7841	.002 mg/L
Vanadium	SW846, 7911	.040 mg/L
Zinc	SW846, 6010	.010 mg/L
Mercury	SW846, 7470	.0005 mg/L

Organic Constituent List:

<u>Analyte</u>	<u>Test Method</u>	<u>Expected PQL (ug/l)</u>
Acetone	SW846, 8260	100
Acrylonitrile	SW846, 8260	100
Benzene	SW846, 8260	5
Bromochloromethane	SW846, 8260	5
Bromodichloromethane	SW846, 8260	5
Bromoform	SW846, 8260	5
Carbon Disulfide	SW846, 8260	5
Carbon Tetrachloride	SW846, 8260	5
Chlorobenzene	SW846, 8260	5
Chloroethane	SW846, 8260	10
Chloroform	SW846, 8260	5
Chlorodibromomethane	SW846, 8260	5
DBCP	SW846, 8260	5
EDB	SW846, 8260	5
o-Dichlorobenzene	SW846, 8260	5
p-Dichlorobenzene	SW846, 8260	5
t-1,4-Dichloro-2-butene	SW846, 8260	5
1,1-Dichloroethane	SW846, 8260	5
1,2-Dichloroethane	SW846, 8260	5
1,1-Dichloroethene	SW846, 8260	5
c-1,2-Dichloroethene	SW846, 8260	5
t-1,2-Dichloroethene	SW846, 8260	5
1,2-Dichloropropane	SW846, 8260	5
c-1,3-Dichloropropene	SW846, 8260	5
t-1,3-Dichloropropene	SW846, 8260	5
Ethylbenzene	SW846, 8260	5
2-Hexanone	SW846, 8260	5
Bromomethane	SW846, 8260	10
Chloromethane	SW846, 8260	10
Dibromomethane	SW846, 8260	5
Methylene Chloride	SW846, 8260	10
MEK	SW846, 8260	100
Iodomethane	SW846, 8260	10
MIBK	SW846, 8260	50
Styrene	SW846, 8260	5
1,1,1,2-Tetrachloroethane	SW846, 8260	5
1,1,2,2-Tetrachloroethane	SW846, 8260	5
Tetrachloroethene	SW846, 8260	5
Toluene	SW846, 8260	5
1,1,1-Trichloroethane	SW846, 8260	5
1,1,2-Trichloroethane	SW846, 8260	5
Trichloroethene	SW846, 8260	5
CFC-11	SW846, 8260	5
1,2,3-Trichloropropane	SW846, 8260	5
Vinyl Acetate	SW846, 8260	50
Vinyl Chloride	SW846, 8260	10
Xylene (Total)	SW846, 8260	5

State of North Carolina
Department of Environment,
Health and Natural Resources
Division of Solid Waste Management

James B. Hunt, Jr., Governor
Jonathan B. Howes, Secretary
William L. Meyer, Director



July 3, 1996

Mr. Gary Tweed
William G. Lapsley & Associates
Post Office Box 546
Hendersonville, North Carolina 28793

RE: Additional Hydrogeologic Review Of The Transition Plan For The
Henderson County MSW Landfill, Permit # 45-01

Dear Mr. Tweed,

The Solid Waste Section Hydrogeologic Unit has completed a review of the November 1995 and June 1996 revisions to the Water Quality Monitoring Plan portions to the Transition Plan for the Henderson County Landfill. A few additional revisions are still needed. Please provide responses to the following comments:

WATER QUALITY MONITORING PLAN (WQMP)

I apologize that my previous review in May did not include your November revisions to the WQMP. It is my understanding that the previously existing monitoring wells (MW-1, MW-2, MW-3, & MW-4) are no longer included in the routine detection monitoring system. The current detection monitoring system for the MSWLF includes wells MW-5, MW-6, MW-7, and MW-8. Monitoring well MW-9 will be used to monitor the older inactive landfill area and is therefore not subject to the .1600 rules monitoring requirements.

Further clarification is still needed on the surface water sampling locations. Based upon the text and Sheet 8, it is my understanding that the four old surface water monitoring locations are no longer to be monitored on a routine basis. I have been unable to locate the new upstream surface water sampling location on Sheet 8. The proposed downstream monitoring location is off-site. Rather than an off-site location, a downstream location for the main creek draining the middle of the site needs to be established where it leaves the facility boundary. Re-establishing the surface water monitoring location near well MW-1 would seem appropriate. This location needs to be sampled at the same time (semi-annually) and for the same parameters as the ground-water samples.

P.O. Box 27687,
Raleigh, North Carolina 27611-7687
Voice 919-733-4996



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Mr. Gary Tweed
Henderson Transition Plan
Page 2

The certification of the monitoring system by a Licensed Geologist has not been signed or sealed.

We are awaiting the revisions from Froehling & Robertson regarding porosity and effective porosity.

The June 12 revisions to the Sampling and Analysis Plan from PACE are now consistent with the rules and policies of the Solid Waste Section.

Additional review of the Sampling Reports will not be done as part of the Transition Plan review. Sampling reports are subject to the review of our Groundwater Compliance Unit.

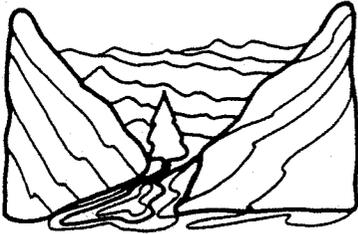
Please provide the corrections and revisions to the Transition Plan as soon as possible, so the Solid Waste Section can complete our technical review. If you have any questions regarding this letter, please contact me at (919) 733-0692, extension 258.

Sincerely,

Bobby Lutfy

Bobby Lutfy
Hydrogeologist
Solid Waste Section

cc: Greg Eades, Solid Waste Section
David Thompson, Henderson County



William G. Lapsley & Associates, P.A.

Consulting Engineers and Land Planners

1635 Asheville Highway
Post Office Box 546

Hendersonville, North Carolina 28793
704-697-7334 • FAX 704-697-7333

September 24, 1996

William G. Lapsley, P.E.
Gary Tweed, P.E.
John B. Jeter, P.E.
Philip Ward, L.S.A.

Mr. Bobby Lutfy
Hydrogeologist
Solid Waste Section
N.C. Division of Solid Waste Management
P.O. Box 27687
Raleigh, N.C. 27611-7687

Ref: Additional Hydrogeologic Review (Letter dated July 3, 1996)
Transition Plan
Henderson County Stoney Mountain Road Landfill
Permit # 45-01

Dear Mr. Lutfy:

Reference is made to your July 3, 1996 letter concerning the additional Hydrogeologic Review of the revisions to the Water Quality Monitoring Plan of the Transition Plan for the Henderson County Landfill (Permit # 45-01). Drawing No. 8 of the surface water monitoring locations have been revised to show retaining the existing upgradient location and relocation of the downgradient surface water sampling location to the main stream just prior to leaving the site. Page 9 of the text of the Water Quality Monitoring Plan (Section 4 of the Transition Plan) has also been revised to show semi-annual sampling. Two copies of each of these revisions are enclosed for insertion into your copies of the Transition Plan.

Froehling & Robertson have provided the enclosed response regarding porosity and effective porosity along with the certification of the monitoring system by a Licensed Geologist. These documents should also be incorporated into the Transition Plan at the end of Section 4.

We hope this provides the additional information you requested. Should you have any questions or need additional information, please contact our office.

Sincerely yours

Gary T. Tweed, P.E.

cc David Nicholson



Section 4.2 Surface Water Monitoring System

The County has in place monitoring of surface waters on the landfill property at four locations near the four existing ground water monitoring wells. Sampling results have not indicated any significant levels of contamination. Iron and manganese have been detected at all locations and, as with ground water monitoring results, have been attributed to natural background conditions. With the degree of sampling required for the ground water monitoring program, it is planned to reduce the stream sampling locations to one upgradient and one down gradient site. Sampling of the surface water streams will be conducted at the same semi-annual frequency as the ground water wells. Upon detection of any significant levels of contamination in the ground water wells that requires assessment monitoring of Appendix II constituents, then it is planned to sample the two surface water streams as well for Appendix II. Should there be no contamination detected, then the surface water streams will return to semi-annual detection monitoring. The two planned surface water stream sampling locations are shown on drawing No. 8.

REVISED 11-24-96

Section 4.2 Surface Water Monitoring System

The County has in place monitoring of surface waters on the landfill property at four locations near the four existing ground water monitoring wells. Sampling results have not indicated any significant levels of contamination. Iron and manganese have been detected at all locations and, as with ground water monitoring results, have been attributed to natural background conditions. With the degree of sampling required for the ground water monitoring program, it is planned to reduce the stream sampling locations to one upgradient and one down gradient site. Sampling of the surface water streams will be conducted at the same semi-annual frequency as the ground water wells. Upon detection of any significant levels of contamination in the ground water wells that requires assessment monitoring of Appendix II constituents, then it is planned to sample the two surface water streams as well for Appendix II. Should there be no contamination detected, then the surface water streams will return to semi-annual detection monitoring. The two planned surface water stream sampling locations are shown on drawing No. 8.

REVISED 11-24-96

SINCE



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GEOTECHNICAL • ENVIRONMENTAL • MATERIALS
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(704) 274-0742 Fax (704) 274-8917

September 30, 1996

Mr. Gary T. Tweed, P.E.
William G. Lapsley & Associates, P.A.
1635 Asheville Highway
P.O. Box 546
Hendersonville, NC 28793

Re: 1) Professional Geologist Certification for Water Monitor Network
2) Groundwater Hydraulics Revision for F&R Report of 10/25/95
Henderson County Stoney Mountain Road Landfill, Permit #45-01
Henderson County, North Carolina

Dear Mr. Tweed:

Froehling & Robertson, Inc. appreciates the opportunity to assist Lapsley & Associates with the referenced information. We have conducted a review of the monitoring information, including monitor well locations, screened intervals, total depths and chemical analytical data. Based on the review, please find an attached Water Quality Monitoring Plan Certification for the Stoney Mountain Road Landfill. A revision of hydraulic information has also been conducted based on new calculations of gradient and new estimation of

Water Quality Monitoring Network Certification

The overall layout of wells and surface water monitoring points appears to be adequate for providing detection of potential impact from the landfill. In fact, the detection to date of organic compound impact at several locations implies that the network is performing its designed function. The proposed additional monitor wells (MW-10 and MW-11) will only strengthen the monitoring network's capacity for impact detection. We concur with the design in placing the additional wells and recommend their installation, and we agree that proposed changes in surface water monitoring points will adequately monitor surface waters near the facility. The continued collection and analysis of water samples according to industry standard protocol and State of North Carolina regulations is requisite for proper monitoring by Henderson County.

HEADQUARTERS: 3015 DUMBARTON ROAD • BOX 27524 • RICHMOND, VA 23261-7524
TELEPHONE (804) 264-2701 • FAX (804) 264-1202

BRANCHES: ASHEVILLE, NC • BALTIMORE, MD • CHARLOTTE, NC • CHESAPEAKE, VA
CROZET, VA • FAYETTEVILLE, NC • FREDERICKSBURG, VA
GREENVILLE, SC • RALEIGH, NC • ROANOKE, VA • STERLING, VA



We expect that the actual gradients in certain areas would vary higher and lower than the averages, with an expected range from approximately 0.040 to perhaps 0.17. The generalized gradient evaluation suggests that an overall gradient of 0.090 can be used in evaluating average flow velocity at the site.

Groundwater Flow

Seepage velocity (shallow groundwater flow) is fluid movement through a porous media, and the use of effective porosity changes the general Darcy flow velocity equation (Velocity = hydraulic conductivity X gradient) to account for pore movement. The following equation illustrates the method used to obtain estimated seepage velocities:

$$V_s = \frac{K i}{n_e}$$

where

- V_s = Seepage velocity
- K = Hydraulic conductivity (derived from slug tests)
- i = Hydraulic gradient
- n_e = effective porosity

Other terms are used in the seepage velocity equation if the viscosity and density of the fluid are sufficiently different from ordinary water. Only severe dissolved impact or free liquid contaminants would have different enough viscosity or density to warrant inclusion of the terms, and none of the wells at the Henderson County facility appear to have enough impact for use of the terms.

Table 1 indicates the revised groundwater hydraulic values for the active wells at the landfill as well as an estimation of average hydraulic values.

**Table 1. Revised Groundwater Hydraulic Values
 Henderson County Stoney Mountain Landfill**

Location	Seepage Velocity	Estimated Annual Flow	Hydraulic Conductivity	Hydraulic Gradient	Effective Porosity
MW-5	0.37 ft/day	140 ft	0.62 ft/day	0.090*	0.15
MW-6	0.21 ft/day	77 ft	0.43 ft/day	0.075	0.15
MW-7	0.13 ft/day	47 ft	0.25 ft/day	0.075	0.15
MW-8	0.19 ft/day	69 ft	0.34 ft/day	0.086	0.15
MW-9	0.14 ft/day	51 ft	0.15 ft/day	0.14	0.15
Average	0.21 ft/day	77 ft	0.36 ft/day	0.090*	0.15

* Estimated for the entire site



Hydraulic Discussion

Effective Porosity

The Solid Waste Section of the North Carolina Department of Environment, Health and Natural Resources recommended a revision to the effective porosity numbers in our Report of Monitor Well Installation and Hydrologic Evaluations (10/25/95). A review of effective porosity information and other hydraulic data suggests a revision of hydraulic information should be performed. Effective porosity is a measure of the pores in an aquifer through which relatively free flow of groundwater can occur. Interconnectedness and tortuosity of pore pathways and water/aquifer media electrochemistry are several factors that influence effective porosity. Our experience indicates typical numbers for effective porosity are in the range of 0.5 to 0.25. We recommend using a value of 0.15 for effective porosity at the site, and we concur that the effective porosity value may be roughly equivalent to the amount of water that would drain by gravity from a sample of the soil.

Hydraulic Gradient

The hydraulic gradients used in our report of October 10, 1995, should also be revised to indicate values roughly based on overall gradients between the upgradient and downgradient locations. Precise information on exact direction and gradient would be required to define localized hydraulic conditions caused geologic structures and by small streams that cross the site. A topographic analysis allows estimation that flow is at a moderate to high gradient and generally flows on a south to south-southwest trend with localized influence around the relatively large stream branch that cuts to the east-northeast through the center of the site. Groundwater flow toward the branch is likely to be prevalent along the segment of the branch that has dry-weather flow, with effects of the branch on groundwater flow lessening in upland parts of its valley along the northeast boundary of the site. Stream branches that have been in-filled during landfill operations in the west and west-central parts of the site may also exhibit some continued influence on groundwater flow.

Regardless of localized effects, shallow groundwater gradient between upgradient and downgradient wells can be used to assess average hydraulic gradients. Head differences range from approximately 140 vertical feet between MW-5 and MW-6/MW-7 over 1800 to 1900 feet of horizontal distance (approximate gradient of 0.075) to approximately 150 vertical feet and 1100 feet of horizontal distance between MW-4 and MW-9 (approximate gradient of 0.14; although flow paths obviously would not directly connect the wells). A gradient between MW-8 and MW-5 was calculated at 0.086 from a vertical difference of approximately 120 feet over 1400 feet of horizontal distance. After installation of proposed MW-10 and MW-11, a more accurate estimation of gradients and flow could be performed by producing a groundwater elevation, contour and flow map, if needed.

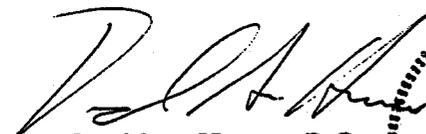


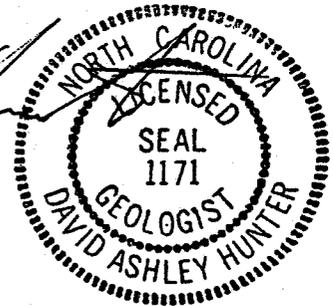
The calculated gradients of 0.075, 0.86 and 0.14 are combined with hydraulic conductivity values for MW-6/MW-7, MW8, and MW-9, respectively. The estimated site average gradient (0.090) is also combined with the hydraulic conductivity for MW-5 and the average hydraulic conductivity derived from monitor wells MW-5 through MW-9. The seepage velocity was also used to estimate annual flow. Chemical dispersion effects and flow retardation effects, due to contaminant sorption with aquifer materials, tend to cancel one another so that the estimated annual flow is a baseline indicator for migration potential of groundwater impact.

Acknowledgement

We appreciate the opportunity to assist William G. Lapsley & Associates with the certification and revision of hydraulic information for the Henderson County Stoney Mountain Landfill. We would welcome an opportunity to provide you with additional assistance including periodic monitoring and analytical testing, well drilling, subsurface assessment, and risk assessment for this or other projects. Please contact us if you have questions.

Respectfully,
Froehling & Robertson, Inc.


David A. Hunter, P.G.
Branch Manager





I, David A. Hunter, as a Licensed Geologist in the State of North Carolina, having been authorized to review the Water Quality Monitoring Plan for the Henderson County Stoney Mountain Road Sanitary Landfill, hereby certify, to the best of my ability, that the Water Quality Monitoring Plan, if implemented by Henderson County, should be effective in providing early detection of potential releases of regulated substances in the uppermost aquifer. The Licensed Geologist certification is part of the correspondence dated September 30, 1996 between F&R and Lapsley & Associates.

Signature *David A. Hunter* Registration No. 1171
Date 9/30/96





I, David A. Hunter, as a Licensed Geologist in the State of North Carolina, having been authorized to review the Water Quality Monitoring Plan for the Henderson County Stoney Mountain Road Sanitary Landfill, hereby certify, to the best of my ability, that the Water Quality Monitoring Plan, if implemented by Henderson County, should be effective in providing early detection of potential releases of regulated substances in the uppermost aquifer. The Licensed Geologist certification is part of the correspondence dated September 30, 1996 between F&R and Lapsley & Associates.

Signature *David A. Hunter* Registration No. 1171
Date 9/30/96



Appendix E
Closure Certification Letter for MSW Landfill

CDM Camp Dresser & McKee

consulting
engineering
construction
operations

5400 Glenwood Avenue, Suite 300
Raleigh, North Carolina 27612
Tel: 919 787-5620 Fax: 919 781-5730

June 19, 1998

Mr. Timothy Jewett
Solid Waste Section
North Carolina Department of Environment
and Natural Resources
585 Waughtown Street
Winston-Salem, North Carolina 27107

Subject: CQA Report - Partial Closure of the
Henderson County Sanitary Landfill

Dear Mr. Jewett:

On behalf of Henderson County, North Carolina, Camp Dresser & McKee (CDM) is providing closure certification and Construction Quality Assurance (CQA) documentation for the 1.9± acre top portion of the Henderson County Sanitary Landfill. This area has been closed in general accordance with Rule 15A NCAC 13B.1627(c) and the Revised Henderson County Transition Plan dated September, 1996.

According to Henderson County estimates, approximately 11 acres of the landfill are classified as Category 3 landfill. This closure certification and CQA report addresses the 1.9± acre portion delineated as CLAY CAP on the attached Site Plan in Appendix E. The remaining 9.1± acre sideslope area closure will be addressed under separate cover.

The final cover system consists of a minimum 12-inch thick intermediate cover layer over waste, followed by an 18-inch thick, 1×10^{-5} cm/sec. (maximum) permeability clay cap overlain with a minimum 6-inch thick erosion layer capable of supporting vegetative growth. The final cover system was constructed by Henderson County personnel. CDM provided general engineering guidance, on site representation, and geotechnical testing services during construction.

Based on the field observations, laboratory test results, and field moisture-density values referenced in this report, CDM certifies that, to the best of our knowledge, the 1.9± acre CLAY CAP area delineated on the Site Plan meets all applicable State regulations regarding final closure of a Category 3 landfill.

Mr. Timothy Jewett
June 19, 1998
Page 2

If you have any questions please do not hesitate to contact me.

Very truly yours,

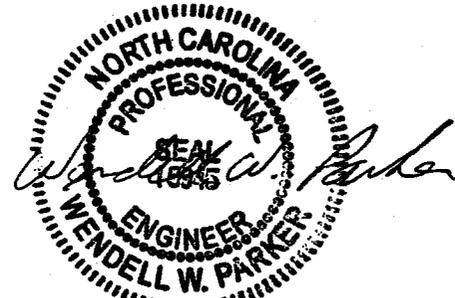
CAMP DRESSER & McKEE

William K. Taylor

William K. Taylor

Wendell W. Parker

Wendell W. Parker, Ph.D., P.E.



6-19-98

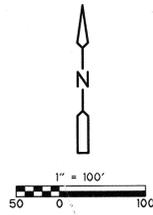
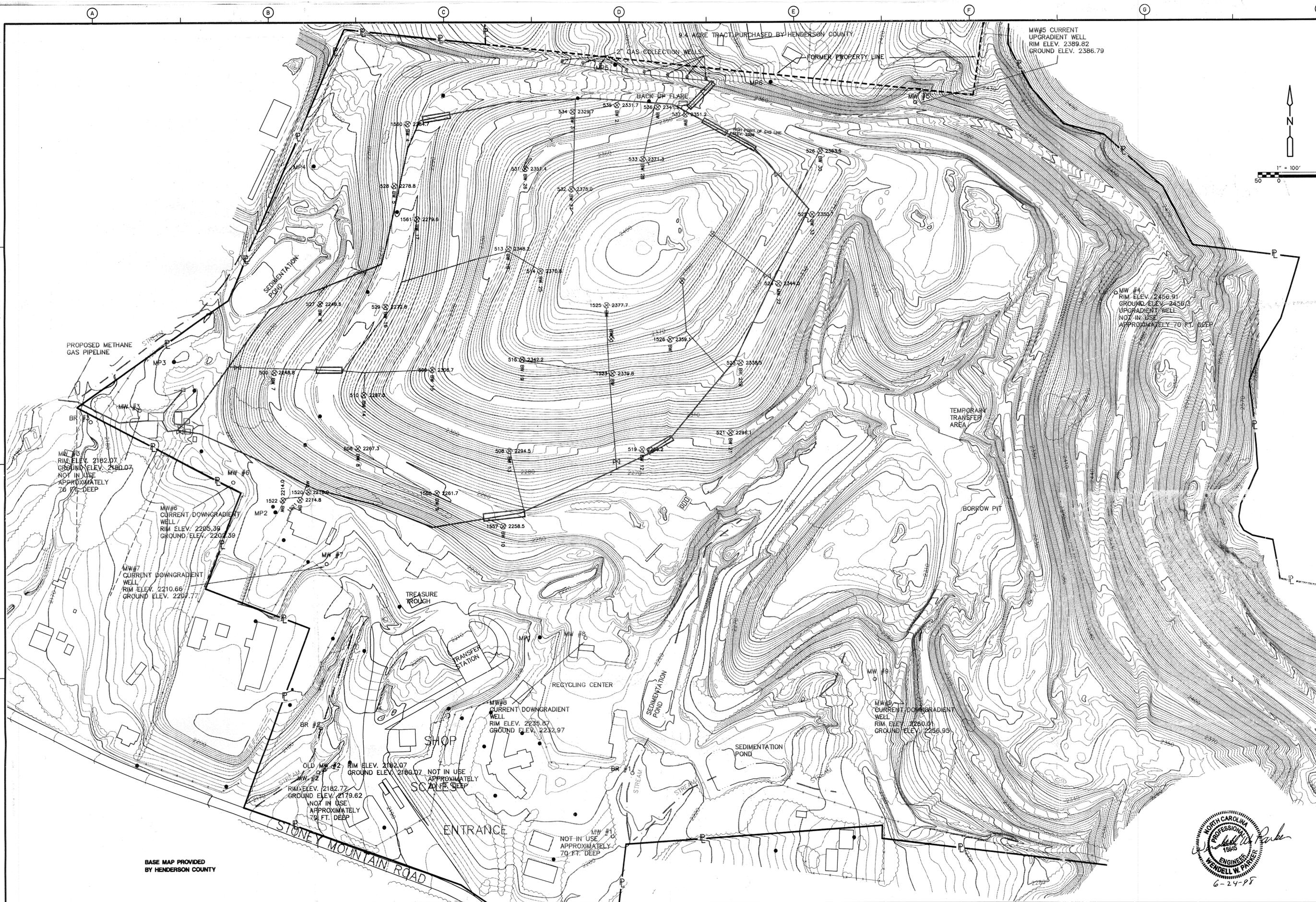
Appendix F
Construction and Demolition Debris
Landfill Drawings

CDM Camp Dresser & McKee

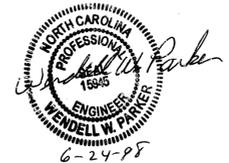
*environmental
services*

offices worldwide





BASE MAP PROVIDED BY HENDERSON COUNTY



REV. NO.	DATE	DRWN	CHKD	REMARKS

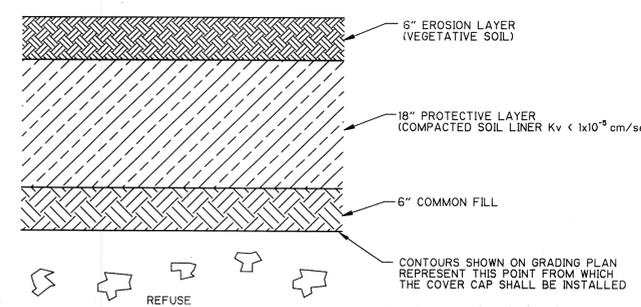
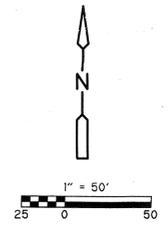
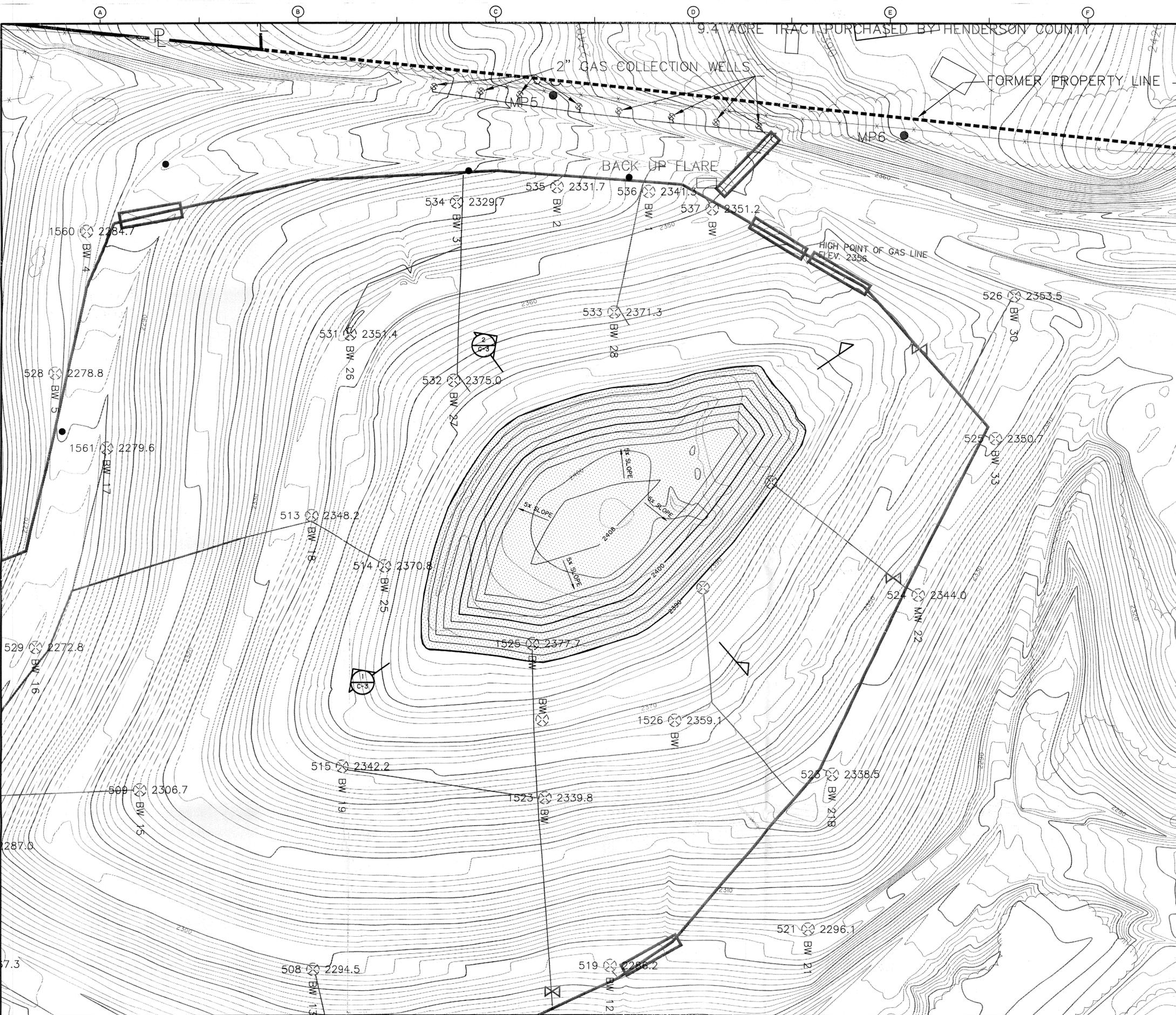
DESIGNED BY: KILLINGSWORTH
 DRAWN BY: J. KILLINGSWORTH
 SHEET CHK'D BY: _____
 CROSS CHK'D BY: _____
 APPROVED BY: _____
 DATE: JUNE 1998

CDM Camp Dresser & McKee
consulting engineering construction operations
 5400 Greenwood Avenue, Suite 300
 Raleigh, North Carolina 27602
 Tel: (919) 787-5620 Fax: (919) 781-5730

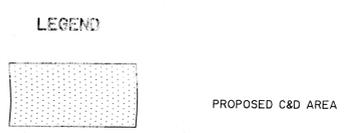
HENDERSON COUNTY
 NORTH CAROLINA
HENDERSON COUNTY C&D LANDFILL

EXISTING CONDITIONS

PROJECT NO. 10002-234
 FILE NAME: C-1.dwg
 SHEET NO. **C-1**



**COVER CAP
DETAIL**
NOT TO SCALE



BASE MAP PROVIDED
BY HENDERSON COUNTY

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. KILLINGSWORTH
 DRAWN BY: J. KILLINGSWORTH
 SHEET CHK'D BY: _____
 CROSS CHK'D BY: _____
 APPROVED BY: _____
 DATE: JUNE 1998

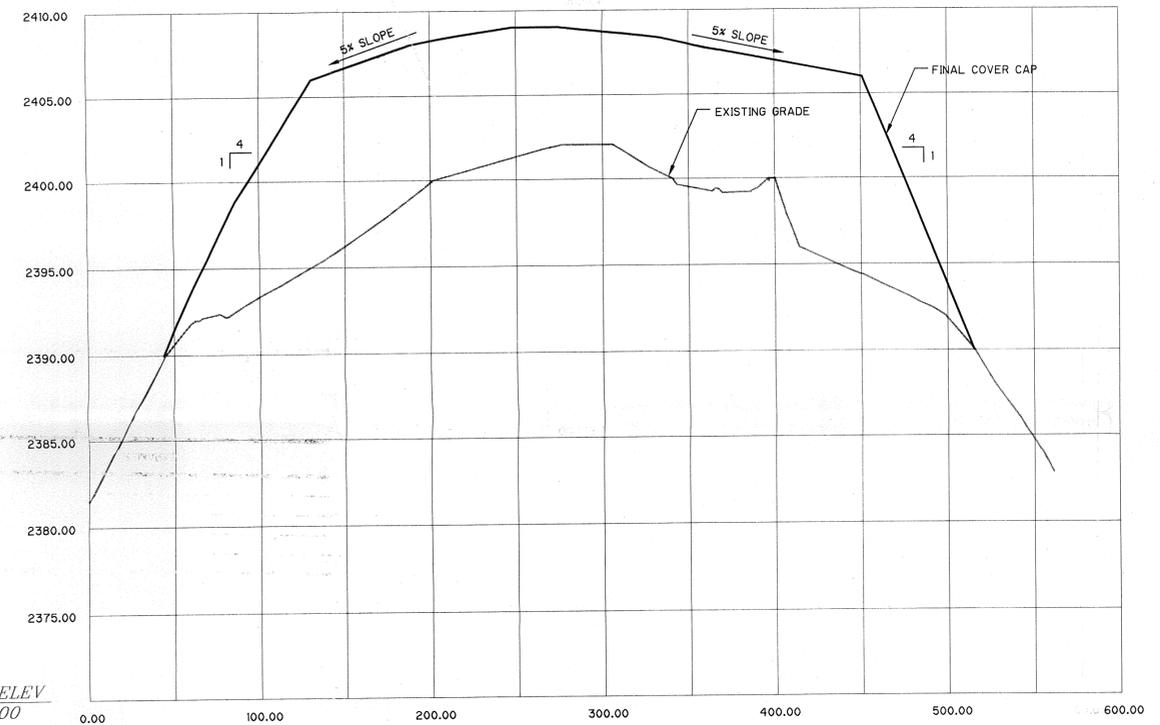
CDM Camp Dresser & McKee
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 Raleigh, North Carolina 27612
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HENDERSON COUNTY
 NORTH CAROLINA
HENDERSON COUNTY C&D LANDFILL

GRADING PLAN

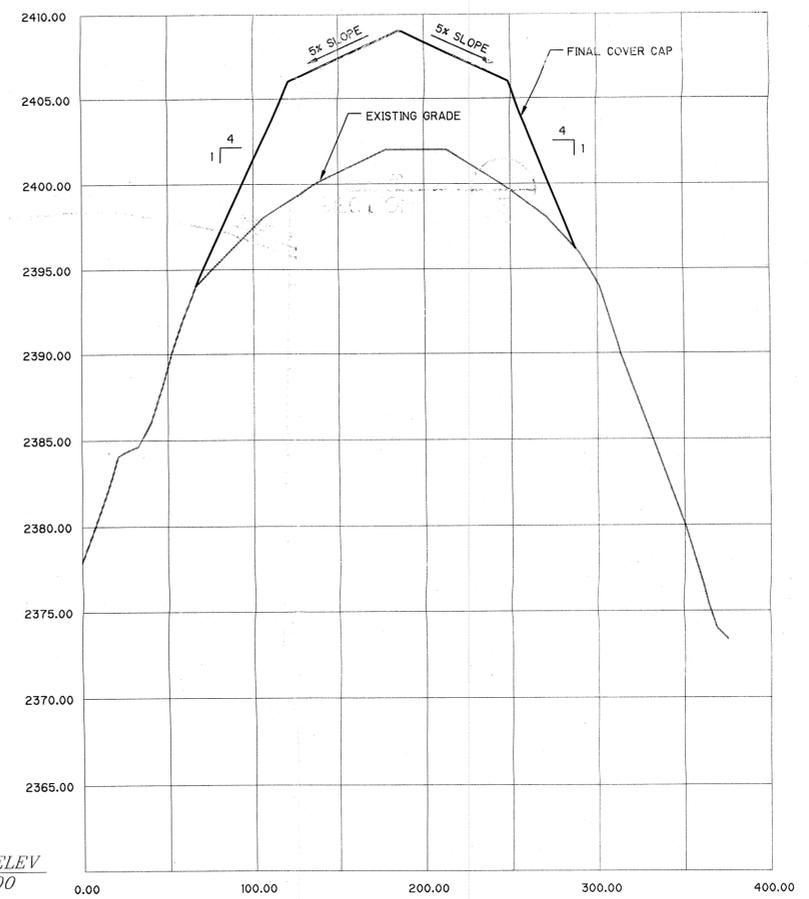
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 FILE NAME: 00-6.dwg
 SHEET NO. **C-2**

DATUM ELEV
2375.00



SECTION 1
HORIZ: 1" = 50'
VERT: 1" = 5'

DATUM ELEV
2360.00



SECTION 2
HORIZ: 1" = 50'
VERT: 1" = 5'



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. KILLINGSWORTH
DRAWN BY: J. KILLINGSWORTH
SHEET CHK'D BY: _____
CROSS CHK'D BY: _____
APPROVED BY: _____
DATE: JUNE 1998

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HENDERSON COUNTY
NORTH CAROLINA
HENDERSON COUNTY C&D LANDFILL

CROSS SECTIONS

PROJECT NO. 10002-234
FILE NAME: C-3.d
SHEET NO. **C-3**